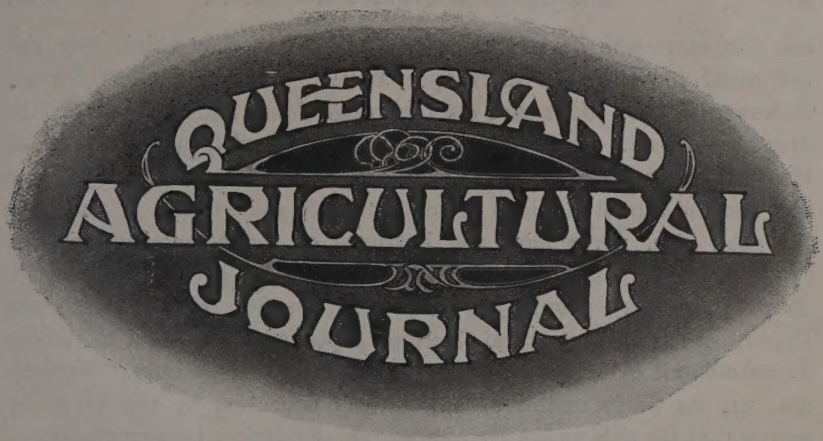


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## THE "QUEENSLAND AGRICULTURAL JOURNAL."

### TO OUR READERS.

In July, 1897, the "Queensland Agricultural Journal" was launched by the then Minister for Agriculture, the Honourable A. J. Thynne, and the New Year 1918 seems a fitting occasion for a short review of its career of over twenty-one years. We are justified in believing that during that period the Journal has met with the unqualified approval of its readers, who comprise not only Queenslanders, but residents in every part of the globe. Thus we hear of its being found on the tables of North and South American and Canadian farmers, in the town and country homes of India, China, many European countries, in Africa, and in the Dominions of the British Empire, where it is greatly appreciated. The sole aim has been from the outset to fill the pages of the Journal with useful and instructive articles bearing upon agricultural, pastoral, horticultural, and other rural pursuits, and those mainly from the pens of contributors who are specialists in the various subjects they have written upon. Many very valuable contributions have been received from pastoralists, farmers, and others giving their own experience of new methods of cultivation, of the effects of different manures, irrigation, &c., also on experiments with new products. Many good inventions and ingenious contrivances for labour-saving have thus emanated from workers on the land. Information on such and kindred subjects have been and will be welcomed by the editor. Farmers are a busy people, and are apt, after a hard day's work, to be more inclined to rest than to sit down and write. There

are also some who do not like to write because they think they are not equal to writing a newspaper article. We do not ask for an elaborate article. Just give us the rough idea, and we will do the dressing-up part. There is many a gem of thought, many a brilliant idea lost to the world because the originator of it is possessed with the idea that he cannot clothe it in sufficiently fine language. If you have the good idea, never mind the language or the composition or the spelling. Leave that to us, and let your ideas be given to the world. Think how many people you may thus benefit. Every month the Department sends out several thousand copies of the Journal to various households all over the State, at the price of postage only. We may sum up the whole matter of agricultural education by the State, by saying that the objects the Department chiefly desires to promote are:—The education of both young and old in the technical and practical knowledge of Agriculture, Dairying, Poultry-raising, Stock-breeding, Fruit-growing, and kindred industries, and the formation of associations and bodies of farmers both for the attainment of objects of material importance to their welfare, and for providing an adequate means of giving expression to the general sense of that important section of the community.

## A COUNTRY ROAD BOARD FOR QUEENSLAND.

In reference to the demand for the establishment of a Country Road Board for this State, the "Farmers' Gazette" for 23rd November quotes the following from the "Queensland Times" (Ipswich and West Moreton):—

"The suggestion is one which is certainly deserving of very serious consideration at the hands of all interested. If due consideration is given to the matter, it is quite within the bounds of possibility that something will evolve therefrom of a practical and beneficial character. The whole community is interested in the development as rapidly as possible of all our industries. It is generally admitted that it will be the success of our primary producers which will constitute the foundation of our national advancement. With natural advantages the State is liberally endowed. Not the least of these are the vast tracts of rich country which, in course of time, must be rendered productive, unless, meantime, they are 'captured' by a 'foe' like the prickly-pear. Development would be considerably stimulated if some workable scheme were devised by which at least reasonably trafficable roads could be constructed between the main highways—the railways—and the producing areas. Prospective settlers see no inducement to take up land in a new district if the prospects of being able to convey their produce to market are remote because of the lack of road accommodation. Some time ago, when urging the consideration of the matter upon the Government, Mr. H. J. Diddams, of Brisbane, who has taken a very keen and active part in local governing matters, made the point that, with adequate railways and main and developmental roads capable of carrying the ever-increasing traffic economically, safely, and with the least possible delay and discomfort, the revenue of the State would advance by leaps and bounds. There is certainly much in the contention, and it constitutes a very sound reason why there should be no unnecessary delay in giving serious consideration to the matter with a view to the creation of some workable scheme. This is one of many methods by which the development of the rural industries can be fostered."

# Agriculture.

## GOOD ROADS.

The road question is one of vital importance to farmers living at any distance from a railway station, and there are many splendid areas of arable land in all parts of the State which would become important centres of agricultural activities were it not for their inaccessibility, owing to the want of roads of communication to a railway. Some twenty-one years ago the Hon. A. J. Thynne, then Minister for Agriculture in this State, took up this question of road-making, and a series of articles on the subject, penned by him, appeared in the "Queensland Agricultural Journal" (Vols. XIV. and XV., 1904). A good article on road-making in farming districts was also published in Vol. XXI., 1908.

It will be interesting to farmers in the districts alluded to by Mr. Thynne to note how the pioneers of the agricultural industry fared then, owing to the want of roads ten years ago:—

"In the days when the Romans, under various emperors, extended their conquests to other lands, they invariably gave great attention to the construction of good military roads, especially in countries which they permanently occupied. These roads were so well constructed that they have lasted for over eighteen centuries, and are as good to-day as when the Roman generals, the soldiers, and the conquered peoples laboured at them. To construct such roads at the present day would be out of the question, for the cost of them would be prohibitive, no forced labour being available, as it was in Cæsar's day. Neither are such splendidly built roads necessary for ordinary country traffic. But, whilst we have been expending our energies and large sums of money in establishing an excellent railway system, we have most shamefully neglected our high roads. Time was when high roads and bridges were made, built, and maintained by the Government, and the main roads, at least, were kept in a good state of repair, because money could generally be found to carry out such public works, and to maintain them afterwards. The building of railways to the interior caused neglect of the main high roads. Coaches and wagons, bullock and horse teams being discarded for railway carriage, it was deemed no longer necessary to keep the road in repair. When the old road boards were done away with, there was no one to attend to the matter, and travelling by road became fraught with discomfort, damage, and danger. Nearly 100 years ago the United States Government was engaged in projecting and building extensive systems of public highways to develop the resources of the country, and probably that policy would have been continued but for the rapid growth of railway systems that seemed better adapted to the needs of the expanding business and the increasing traffic of the country. Within recent years there has been no adequate system for maintaining the highways in that country, and, as an American journal puts it, 'their condition in this age of general development is a disgrace to a civilised nation.'

"Now, an Office of Public Road Inquiries has been established through the Department of Agriculture, and this office is maintained by yearly appropriations from the public Treasury, resulting in great good in promoting road improvement, and there has been an increasing demand upon this office, not only for achieving aid, but for material assistance. In responding to the people's call for Government aid, there has been made a safe and healthy beginning, and the time is opportune for enlarging and extending the work in that country.

"In our State of Queensland the making and maintaining of the roads devolves upon the Shire Councils, who are empowered to levy rates for these purposes. In many parts of the country, such as in mountainous districts, as, for instance, in the Blackall Range and Main Range, and on vast stretches of deep alluvial or volcanic plains, such as the Darling Downs, the formation of good solid high roads is beyond the means of the Shire Councils, whose funds have many other calls upon them. A great many necessary public works in the various shires have to be carried out by the aid of loans from the Government, but these loans have to be repaid, together with interest. If loan after loan is granted, and repayment deferred to the Greek Kalends, then it practically amounts to the work being done, as in olden times, by the Government. It was precisely to avoid this that, together with other reasons, local government was established. The old system gave rise to many abuses

and easily obtained grants for local purposes were often diverted from the objects for which they were intended, and expended in some other direction. In some districts, the roads are a credit to any country, but when the highways are in such excellent order it will be found that the local conditions are all favourable to inexpensive, yet effective, road construction. The greatest trouble about roads exists in the farming districts, and in many of them road-making is limited to throwing up a heap of black soil, and building culverts over the worst gullies. Metalling the black soil road is useless under such conditions, and the Shire Councils are not in a sufficiently flourishing condition financially to incur the great expense of properly 'building' roads over the rich alluvial plains. During a continuance of dry weather there is no trouble with the plains roads, unless it be in districts where they are badly cut up by timber wagons; but in wet weather travelling by wheeled vehicles is next door to impossible. A glance at the illustration on another page, of a road in the Maroochy district, will show the sea of mud and water the unhappy settler must struggle through to reach the railway. The worst roads in this State are, as stated, in the hill country and on the blacksoil plains. It is possible to ride or drive over the latter during heavy rains; but when the soil begins to be less saturated, travelling, if not impossible, is exceedingly hard on horses and bullocks employed in wheeled traffic. In the mountainous country the farmer has to contend with very steep gradients, as well as with deep, adhesive mud. In the Blackall Range the pioneers of settlement were the timber-getters. Their bullock teams drew the logs from the scrub by the nearest route, irrespective of steepness, as the road to the railway is all down-hill, and the teams returning with empty wagons were able to negotiate the steep bush tracks. When the farmer came along, however, to settle on these lands, the question of roads became a very serious one. But those responsible for opening roads for the farmers contented themselves with improving the old bullock tracks, by taking out a few stumps, cutting down a very bad sidling, leaving a road so narrow as hardly to allow two carts to pass each other. And even where the worst steeps were reduced by heavy cuttings, the gradient in several places is 1 in 2. We have only lately seen a bullock dray, empty, drawn by sixteen bullocks, stopped twice on one of these long, steep hills, to rest the animals. Those who are learned in the traction power of draught animals have proved, by incontestible figures, what actual force has to be expended by a horse in drawing a certain load on level and on steep roads. It appears, by tables published by the Department of Agriculture of the United States, that a horse can exert a tractive force of 83.33 lb. for ten consecutive hours at the rate of 3 miles per hour. This means that he can move a ton for 30 miles in ten hours over a smooth, well-made gravel road. But taking a grade of 1 in 30 he can only move it 11 miles. If the gradient is increased to 1 in 10, he could only move it 5 miles. How far could he move a ton on such a road as that from Nambour to Dulong—where the gradients are so very steep? He could not move it at all. A settler at Mapleton has been bringing cedar in flitches down this range. His load, with four horses, does not exceed 600 ft. The distance is about 9 miles, and it takes the best part of two days to go and return. We do not enter here into the question of wear and tear on harness and wagon, which must be considerable. Then there is the loss of time to the driver. That is of as great importance as any other factor in the business. There are three ways of improving this state of affairs. The existing roads where these excessive gradients occur could be divided into sections of steep and level. If short level stretches were to succeed short pinches, before the strength of a team is exhausted by a long pull, the cattle would be on level ground, and there recover breath and move easily on to the next short steep to be negotiated. Thus the top of the range would be reached in shorter time, and with greater ease to the cattle. The second plan is to abandon the road where these steeps occur and contour the ridges. There is a piece of country running below the pinches we mention, where a road could be carried in 2 or 3 miles, which would not have a gradient of more than 1 in 30, and which would, in even a shorter distance, reach the objective point beyond the ridges. This is only a single instance of many mountainous roads in the State which we could point out. The third and best way of overcoming roads in gradient difficulty is the narrow-gauge tramline. Such a tramline has now been built in this particular part of the range, and an 8-h.p. motor-car has taken a load of 5 tons up the range at the rate of 3 miles per hour. We believe that not even 1 ton has ever been taken from Nambour to Mapleton by horse power and wagon.

"As for the black soil plains, the building of roads, as we have pointed out, is a matter of *naturæ locis*. Stone and gravel are plentiful in many parts of the Darling Downs, or of the Downs country of the Central and South-Western districts, and where such is the case excellent roads have been constructed, as witness the road running from Warwick to Freestone and Swan Creeks. Many persons know that for a long time it was deemed impossible to make a road of any kind across Chatmoss,

PLATE 1.—A SCRUB ROAD IN THE MAROOCHY DISTRICT.

in England. Millions of tons of stone were emptied into it to form a road for the railway, only to be swallowed up in its bottomless abysses. Yet, to-day, the trains run regularly across this shaking bog. The roadway was made of fascines, on which the sleepers, rails, and ballast were laid, and the road is as solid and firm as if it ran over rock. Our blacksoil plains are not bottomless. But if the top crust is broken, many more tons of broken metal would be required to form a firm road than if it ran over a sandy plain. Here fascines would come in. The road could be formed, drains made on each side, the surface laid with fascines, as has been done in the case of the training walls at the Hamilton Reach of the Brisbane River, and on these fascines a firm roadway could be built. We propose to continue this subject of good roads for farmers, as it is one of vital importance to them, and we shall endeavour to throw all possible light on it, in the hope that eventually the proverb about dropping water wearing away a stone will be realised in the determined effort of all Shire Councils to provide easy means for farmers to bring their produce to the various railways."

While much good agricultural land and land suitable for fruitgrowing and market gardening is found in this State, in districts where the nature of the country permits of the making of excellent roads at small cost, as, for instance, at Nundah and Nudgee, Oxley, Beenleigh, the neighbourhood of Ipswich, and many other favoured districts of East and West Moreton, as well as in some districts such as Warwick, on the Darling Downs, by far the greatest portion of the finest agricultural lands in the hill districts are almost inaccessible owing to the want of roads on which reasonable loads can be carried by horse or automobile power. The cost of ordinary road-making may be set down at about £800 or £900 per mile. A hill road in mountainous country would cost considerably more. Then there is the constant maintenance, for if a road is not kept in repair, especially when it is constantly cut up by the wheels of timber-wagons, it might as well not be made, for a bush road cut up into deep ruts and washed out by heavy rains is more useless and more dangerous than the ordinary bush tracks which may be avoided by constant detours. On a main road, the traveller is confined to the space between the watertables and the fences, and cannot avoid ruts, holes, boulders, and bogs. So long as the wheels of heavy wagons remain unchanged as to their narrow tires, so long will the cutting up of the roads continue, and the expenditure on repairs continue to be a serious burden on the taxpayer. For, be it remembered, neither main road nor any other roads branching from it bring in any revenue. Not only has interest to be paid on the initial cost of construction, but also that on the expenditure for repairs, both to the road and to the bridges and culverts. There is no revenue to be derived from these, except by means of that relic of the dark ages—the toll-bar. The infliction of toll-bars would be justly resented by the travelling public.

Much wear and tear of roads would be avoided if all vehicles carrying heavy loads, such as timber, wool, minerals, &c., were compelled to adopt a broad tire. In some parts of the State the broad tire has been adopted with much benefit.

At the Agricultural Conference in Maryborough in July, 1903, the Hon. A. J. Thynne, M.L.C., read a most interesting paper on "Queensland Country Roads." During the discussion which followed, Mr. Atkinson, of Danderoo, said:—

"The question of road-making and good roads is a very big one, and the difficulty our shire councils have to encounter is the fact that they have so many roads to attend to. Our shire council is in a pretty wealthy district, and has been very sympathetic to the farmer. . . . . As for road-making generally, there is no doubt that a lot of money is wasted for want of a little more. Farmers would help themselves if they adopted the broad tire. I am by trade a wheelwright and coachbuilder, and can say that the general introduction of broad tires will do as much as anything to solve the bad road difficulty. The broad tire is the very best that you can put on farm lands, and when I started farming the first thing I did was to build a dray with 4-inch tires. I wanted 5-inch, but there was a difficulty in getting them. It is the lightest dray in my part of the district, yet I can guarantee to take on it a bigger load to the railway with one horse than any other man on the countryside. The local authorities could do much to encourage the use of broad tires. If there were a tax put on all new 3-inch tires, we should soon get wider ones. When the wheelwright firm I was in first went to Hughenden, we found the 3-inch tire was the standard, and we said to the woolmen: 'Go in for wider tires.' When we left there we had instituted the 6-inch tire—the greatest road-maker ever introduced onto the blacksoil plains."

A wheel tax is also imposed in some districts, but still the problem of cheap, useful roads, in constant good repair, has not been solved. When a railway passes through a country district, the main road is at once neglected, it being supposed that people will naturally employ the railway for the carriage of heavy goods. And

doubtless this is largely the case; but railway stations and good sidings are not built at every man's sliprail, nor will a train pull up anywhere and everywhere for the pubic convenience or inconvenience. Therefore, the main road is still required to enable people living at a distance from a railway station to carry their goods to and from it.

The remedy for this state of affairs lies in the substitution of light railways or tramways for metalled or unmetalled roads. The cost of a tramline, on the narrow 2-foot gauge system, even in hilly country, does not amount to more than from £800 to £1,000 per mile, about the same as the cost of an ordinary road. But the tramline service is productive of revenue. Wherever tramlines have been built they have usually paid their way, or, if they have not done that, they have gone so near it that the deficiency bears no proportion to the annual outlay on the highroads. The cost of maintenance is also much less, once the line has been faithfully built. On level country trams may take the place of trains, travelling, certainly, at less speed, but, nevertheless, conveying goods and passengers in certainty and at regular times to their destinations. The running of a train of tramcars capable of carrying from 20 to 30 tons would necessitate the employment of but two men, as in the case of street cars. If those 30 tons had to be carried by wagons drawn by horses over bad roads they would employ thirty horses and fifteen drivers. In heavy weather and on boggy roads the team could often not travel at all, but the tram train would not be hampered with such considerations, except at such times as when heavy floods occur; and even then the tram has the advantage, as, even before the water has completely left the track of a line in flooded country, the cars could run, whereas the wagons would have to remain until the sodden roads became hard enough to bear their weight.

Mr. Thynne, in concluding his paper, gave a table of gradients between 1 foot in 10 and 1 foot in 30, showing how much the hauling power of a horse is affected by the grade of a road as compared with his hauling power on a level road of the same quality, which is taken as represented by the unit 1:—

TABLE OF GRADIENTS.

| Inclination. | Angle. | Rise in Feet per Mile. | A Horse can Draw— |
|---|---|---|---|
| 1 in 10 .. .. .. .. | 5·43 | 528 | 0·25 |
| 1 in 11 .. .. .. .. | 5·11 | 480 | 0·265 |
| 1 in 12 .. .. .. .. | 4·46 | 440 | 0·28 |
| 1 in 13 .. .. .. .. | 4·24 | 406 | 0·295 |
| 1 in 14 .. .. .. .. | 4·5 | 337 | 0·31 |
| 1 in 15 .. .. .. .. | 3·49 | 352 | 0·325 |
| 1 in 16 .. .. .. .. | 3·35 | 330 | 0·34 |
| 1 in 17 .. .. .. .. | 3·22 | 310 | 0·355 |
| 1 in 18 .. .. .. .. | 3·11 | 293 | 0·37 |
| 1 in 19 .. .. .. .. | 3·0 | 277 | 0·385 |
| 1 in 20 .. .. .. .. | 2·52 | 264 | 0·4 |
| 1 in 24 .. .. .. .. | 2·23 | 220 | 0·5 |
| 1 in 25 .. .. .. .. | 2·18 | 211 | 0·52 |
| 1 in 26 .. .. .. .. | 2·15 | 203 | 0·54 |
| 1 in 30 .. .. .. .. | 1·55 | 176 | 0·64 |

Thus it appears that, if on a level road a horse can draw 1 ton, he can only draw 5 cwt. up an incline of 1 in 10, or about 12 cwt. up an incline of 1 in 30. He could only draw about 6 cwt. up an incline of 1 in 17. The little motor on the Nambour tramline can take 5 tons up an incline of 1 in 17.

## NATIONAL ROADS ASSOCIATION OF NEW SOUTH WALES.

"Local Government," a Queensland publication, lately published the following particulars of the work of the National Roads Convention recently held in Sydney, when the following resolutions were passed:—

"1. *Main Roads.*—That this conference, being of public representative character and not concerned in the domestic management of by-roads by the local councils, limits itself entirely to the consideration of main roads.

"2. *National Importance of Good Roads.*—That this convention is of opinion that the present condition of the main roads causes incalculable loss to the business community and excessive inconvenience to the general public, and, therefore, that it calls for the inauguration of new methods of construction, maintenance, and administration.

"3. *Development and Decentralisation.*—That this convention urges the adoption of a main road policy which will insure:—

(*a*) The connection of large producing districts with their shipping points, whether on river, coast, or rail;

(*b*) The establishment of through routes of communication between the capital and the country districts;

(*c*) The establishment of a properly thought-out system of metropolitan main roads giving access not only between city and suburbs, but also between suburb and suburb.

"4. *General Policy of Control.*—That this convention affirms the principle that there should be a continuous thread of Government guidance and control running through the main roads policy, and that that policy, subject to the aforesaid guidance, should be based upon co-operation between the Government and the local councils.

"5. *Apportionment of Upkeep.*—That when the main road is once properly constructed there shall be a definite policy laid down as to the future apportionment of the cost of its upkeep.

"6. *Durable Construction.*—That upon main roads it should be the set policy to construct only in a thoroughly substantial manner, as that will yield the truest economy in the long run.

"7. *Grading and Location.*—That upon main roads there should be a constant endeavour to secure the best location, grading, and drainage, and that, in any position where it is known that the location, grading, or drainage could be improved by a re-location, whatever money is available shall be reserved for the construction of the deviation rather than the patching or improvement of the existing road.

"8. *Each Road a Complete System.*—That every main road should be dealt with as one continuous means of transit right through the whole of its length.

"9. *A Main Roads Board.*—That for the purpose of the previous resolution there should be a Main Roads Board established, which shall have power to declare what are main roads and to distribute among main roads the money votes of Parliament therefor, to co-operate with and subsidise the local councils in order to secure the construction and maintenance of main roads, and to construct and maintain main roads in case the local councils make default in that respect.

"The powers of the Main Roads Board are briefly: To resume land for road resumptions, deviations, and quarries; to construct and maintain main roads, hire or sell road-making plants to shires and municipalities, and to maintain ferries; to test road materials and methods of road construction and maintenance; and, where deemed wise, to engage in the manufacture of road-making material.

"As to the constitution of the board, it is to consist of a president (who shall be a business man), two Government representatives, one of whom shall be a highly qualified engineer, and the other a representative of the vehicle and motor taxpayers; one representative of the shire council, and one representative of the municipal council.

"The cost of construction and maintenance of main roads is to be shared between the various councils and the Government, through the Main Roads Board.

"Amongst the sources of revenue for these purposes are the present main roads vote, the proceeds of motor licenses and taxation, a gneral graduated wheel tax on all vehicles. The main roads boards in connection with the metropolitan area are to have power to levy by requisition upon the local councils, but in no case is such levy to exceed ½d. in the £1. The Main Roads Board is also to have power to borrow a sum not exceeding £2,000,000, in such sums as the Minister may from time to time approve.

"The conference affirmed the desirability of legislation governing the width of tyres. In the case of two-wheeled vehicles, if the width of the tyre be less than 3 inches the maximum weight of vehicle and load together must not be more than 2 tons; tyre 4 inches, weight 2½ tons; 5 inches, 4 tons. In the case of four-wheeled vehicles, if the width of the tyre be less than 2½ inches, the weight may not exceed 2 tons; tyre 3 inches, weight 2½ tons; tyre up to 5 inches, weight 5 tons; 7 inches, 12 tons. Where a vehicle is hung on springs, the weight of the load may be increased by 5 per cent.; but in no case can more than 4 tons be carried on a two-wheeled vehicle, or 14 tons on a four-wheeled vehicle.

"A percentage of the proceeds of all sales of Crown lands to be set aside and added to the main road vote. In view of the close relationship between the railways and the roads, the latter acting as auxiliaries to the railways, provision should be made to allow of all road-making materials and machinery to be carried at special rates.

"When any person shall damage a road by any extraordinary or unreasonable use of it, the cost of repairs may be recovered from such person.

"That for educational purposes, an inquiry should be conducted by the Government to place on record the actual figures of the saving effected and the increase in land values following upon road construction, and that such information be widely disseminated.

"That all bodies with statutory powers consult the Main Roads Board before opening up any main roads, and that they be compelled to replace the road in an efficient state of repair."

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## IRRIGATION.

### ECONOMIC AND PRACTICAL METHODS—No. 1.

By P. MAHONEY, Cooper's Plains.

#### FOREWORD.

Having had a considerable amount of experience in one of the largest irrigation settlements in Australia, I consider it is only fair that I should share my experience with any farmers to whom it may prove of any use, as I myself have derived much knowledge on different subjects through this same medium under similar circumstances.

#### LAYING OUT AND GRADING.

To make a success of irrigating, it is necessary to know how to lay out the land intended to be irrigated, the means of conveying and utilising the water, and the art of cultivating thoroughly, which is closely connected with successful irrigation.

The land must be thoroughly graded—that is, the surface of the land made level. Even on hilly land it is necessary that it be graded, for any lodging of surface water in hollows, &c., is detrimental in several ways, viz.:—It is apt to bring on seepage through excessive water and bad drainage, which is disastrous, and if water is allowed to lie on the ground during a hot day there is a possibility of the plants being killed owing to the water getting too hot. The over-supply of moisture to the plant causes, in many cases, forced growth, which is not beneficial to the fruit, &c., for it impairs their keeping qualities; consequently, the carrying qualities are not so good.

The direction in which the land is to be irrigated should be decided upon according to the nature of the soil, for the looser the soil the greater the fall should be, as it absorbs the moisture in quicker time than heavy soils. Therefore, it is necessary to have the fall in the land accordingly. It is considered that from 6 to 9 inches of a fall to the chain in sandy rises is most convenient, and that on heavy soils 4 inches or even less is considered enough. Never should the rows to be irrigated be any longer than 5 or 6 chains, for if so, the plants at the top end are likely to get an over-supply of water before the water has reached the bottom ones, which, of course, is dangerous.

In growing fodders, such as lucerne, wheat, &c., it is necessary to have the land practically level, for the only way of watering such crops successfully is by flooding, although hilly land can be made to grow such crops satisfactorily by terracing the lands; but this is much more expensive than preparing flat lands. After the land has been graded and ploughed, it is essential to build check banks, to afford a thorough watering. These banks can be made so as to permit the mowing machine to be driven over them while in action. This is necessary, as crops can be grown upon them. These banks should be about 8 inches high, and should not be made abrupt. The best and quickest way of making them is by ploughing six furrows, three one way and three in the other direction, having the two middle furrows overlapping one another, then drawn up with the disc cultivator, or by repeating the ploughing again after harrowing. Effective and serviceable check banks can be made in that manner.

Land to be irrigated by flooding should be divided into quarter-acre patches (by such banks), which will be found to be the most serviceable size. If the land has a slight natural slope, it is advisable to divide it off into narrow beds running with the fall of the land. In this manner it can be watered satisfactorily. It is necessary to have pipes in these banks so as to allow the water to flow from bed to bed.

There are several different kinds of implements used for the grading of land. If the latter happens to be very rough, a buckscraper or scoop is necessary, for with this implement it is possible to grade any land for irrigation, but if only slightly bumpy, a "slicker" will do the work. A slicker is a home-made instrument consisting of two hardwood planks about 8 feet long by 1 foot wide, fastened together about 2½ feet apart, the front plank having a slope outwards, and the back, a slope in the reverse direction, with the bottom edges sharpened, so that they will grip the soil and carry it from the bumps, and drop it into the hollows. Suitable boards should be fastened on it so that the driver can stand comfortably. This implement should be drawn by two horses, and it is necessary for the driver to stand on it while working. Harrows with a piece of board fastened in front of the back tines will do good work (when the land is not rough) when standing upon them and driving across the mounds, then getting off to release the soil after passing over them.

If the soil has to be carried any distance, the buckscraper will have to be used, as the slicker will only drag the soil for a sort distance.

A good way of ascertaining the level of a piece of ground is by the use of a spirit level and boning rods.

[TO BE CONTINUED.]

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## IMPROVED METHODS OF DRYING AND MOUNTING PLANT SPECIMENS.

By H. W. ANDREW, Botanical Assistant, &c.

Several requests having been made for details concerning the methods adopted by this Department in preparing and mounting plant specimens for exhibition and demonstration purposes, it has been decided to publish particulars for the information of those who may be interested. While the study of the plant in the field, where practicable, is much better, the use of well-dried and mounted specimens has many advantages. The botanist and the agricultural teacher will always have to depend largely on herbarium specimens for reference and general educational purposes. The methods described below embody two or three details which, so far as South Australia is concerned, represent quite new features of the agricultural educationist's work in this direction. The specimens completed for departmental use cost under 2s. 6d. each (exclusive of time and labour absorbed in collecting and drying the plants). They are light, portable, practically unbreakable, dust-proof, &c. The transparent celluloid facing accommodates even bulky specimens, and at a cost much less than glass.

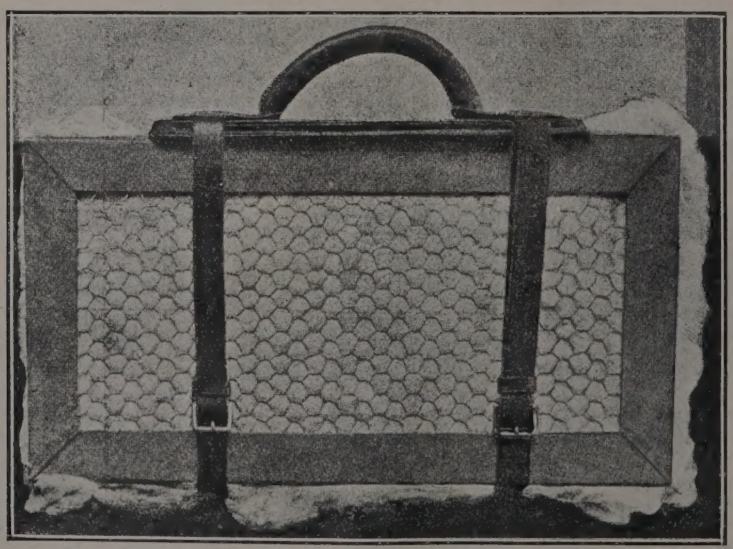

PLATE 2—PLANT PRESS.

Certain district councils, Agricultural Bureaux, and other institutions have applied to the Department for sets of the proclaimed noxious weeds. These will be supplied by the department at a cost of about 2s. 6d. per specimen. The exhibition of these in council chambers and such places should do much towards clearing up the confusion existing in the minds of so many people respecting the identity of even common plants.

### Drying Specimens to Preserve Colour, Etc.

This involves the employment of sheets of cotton wadding placed in several layers between two wire netting trays or grids, having a mesh of about ½ in. The netting is framed with heavy-grade galvanised iron 2½ in. wide before the latter is doubled over to hold the netting. The required pressure is applied by means of leather straps. The overall measurements of such a press for general purposes

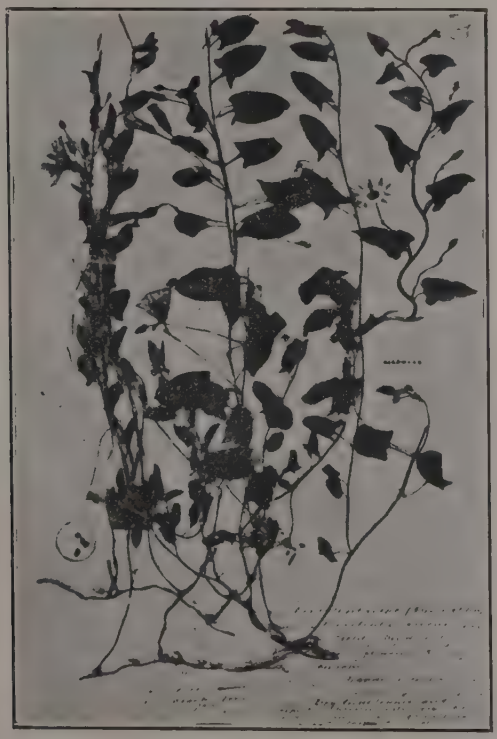

Plate 3.—Mounted Specimen, as supplied by Department of Agriculture for Reference.

may conveniently be 12 in. by 17 in. In the hottest sun seven or eight layers of plants have been dried successfully in the one press, and in cold, damp weather, with the use of an electrically heated oven, possibly still better results have been obtained, the plants being dried in a few hours. In the case of plants with conspicuous flowers, it is desirable to detach and dry the flowers in a separate press, so that leaves, &c., shall not come in contact with them. Tubular flowers are best treated by filling with small pieces of cotton wool, and where petals overlap one another, pledgets of cotton wadding should intervene. Detached flowers are probably best mounted by narrow strips of transparent adhesive paper.

There can be no question that such a press is admirably suited for the drying of plants (as well as flowers, for which a somewhat similar press has been used and described by Dr. Claud F. Fothergill, of England), the natural shape and colour being retained to a remarkable degree. Such a press might with advantage be

carried into the field when collecting. The specimens, of course, may be left in the press undisturbed until completely dried, so that the old, time-absorbing method entailing the frequent changing of blotters, &c., is obviated. The sheets of cotton wadding employed here have been in use almost daily for twelve months, and are still in a serviceable condition. The finished or smooth side of this material should come in contact with the specimens, otherwise considerable trouble may be experienced in getting rid of the wool from the sticky, hairy, and prickly plants.

### MOUNTING SPECIMENS.

"Two-pounder" strawboards (about ¼ in. thick) are used, size 12 in. by 17½ in. Suitable white paper is pasted to either side to restrict warping and add to the appearance of the mount. As it is important to familiarise farmers and others with the appearance of weed seeds or fruits (in addition to the plants themselves), a hole is punched through the cardboard to accommodate them, and a small separate piece of celluloid is placed over the top of the hole, before pasting paper referred to above over the face of the mount. After the seeds are placed in this pocket, from behind a piece of gummed cloth is stuck on to keep the seeds intact. The specimen after drying, is carefully arranged and fastened to the mount by means of transparent adhesive paper, and the mount labelled. The mount and its specimen are then fumigated with carbon bisulphide for sixteen hours, and immediately afterwards the whole is covered with transparent celluloid by gumming the latter to a narrow strip of binder's cloth and afterwards sewing together to further strengthen it, finally framing by gumming the free edge of the cloth to the mount. It might be pointed out these mounts may be used to advantage in showing specimens other than weeds, such as wool, insects, &c.—"Journal of Agriculture, South Australia."

## THE COMING WHEAT CROP.

In Melbourne they are indulging in a forecast of the approaching wheat harvest of the Commonwealth, placing it at 68,000,000 bushels, as compared with 115,000,000 bushels last harvest, and with 152,000,000 in 1916-17. The Victorian yield is placed at 24,000,000, and New South Wales and South Australia at 15,000,000 each. The Queensland crop is estimated at less than 20,000 bushels, severe drought conditions being responsible for decreased crops even in the most favourable wheat-growing districts. The wheat harvest for the year 1916-17 totalled 1,035,268 bushels. The area under grain is known to be reduced, and the season has been too dry, so that the yield is expected to be considerably less. But forecasts before the grain is cut are apt to be very unreliable. Such a harvest would give little more than another 30,000,000 bushels for export.

## CHANCES OF LIFE.

The "New Zealand Farmer" asks—Which would you rather be, a new-born babe or a soldier in the trenches? In which condition would your chances of living a year be greater? This sounds like a foolish question, says Mr. G. E. Earnshaw, in the "Infants' Department" (Chicago). One would naturally suppose that a baby, sheltered in the home, and tended constantly by the loving hands, would have a better chance of living than a soldier on active service. And yet the contrary is true. The perils of shot and shell, of bayonet thrusts and bursting hand-grenades, of disease from exposure or infection—all these exact a toll of life considerably less than that paid by the nurseries. Out of every seven babies born, one dies before it is a year old. One in seven is more than fourteen in the hundred. So the soldier, braving disease and death in the camp and on the battlefield, has a seven times better chance of life than the newborn baby. Out of the 2,500,000 babies born every year in the United States, more than 350,000 die before they are a year old. Of the same number of soldiers, only 50,000 will die in a year as a result of their exposure to the risks of war. Terrible as is the toll of life exacted by war, the losses suffered by our infant population through improper foods and clothing, the ignorance of midwives, and, alas, of mothers also, is yet more terrible.

# Pastoral.

## THE CLARIFICATION OF WATER IN LARGE DAMS.

Application is occasionally made to the Department of Agriculture and Stock for information as to the best method of clarifying the water in large dams which has become foul through the constant access of live stock, the washing in of the soil, or other causes. It frequently happens that where the dam is not fenced the water speedily becomes very foul and quite unfit for the use of animals. This can be generally prevented by carefully fencing off the same and allowing animals to enter only a sufficient distance to satisfy their requirements, or, what is better, by enclosing the whole with a strong fence, and pumping the water into drinking troughs by windmills or other means.

If the water is highly charged with organic matter, and is foul to the senses, an effective method of procedure is as follows:—

Obtain a number of boxes about the size of small fruit cases, and perforate the bottom and sides with $\frac{1}{8}$ in. holes. Partly fill these boxes with a mixture of commercial alum and sulphate of iron in equal parts. Attach the boxes to wires or strings and pull them backwards and forwards across the surface, so that a fair quantity will be dissolved, which will at once cause a precipitation of the foul matter and leave the general body of water clean and practically free from impurities. The only thing still required to make it fit for domestic use is to aerate and charge it with dissolved oxygen, which can be done by passing it through a spray and a fine sand filter.

ARTHUR MORRY,
Surveyor, Department of Agriculture and Stock.

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## THE COMING OF THE FRIESIAN.

In every State of the Commonwealth interest in the great black and white breed is increasing. There are more breeders in Queensland than in any of the other States, but the largest herds are located in New South Wales, and the best herd that this paper knows is in Victoria. On all sides one hears the question: "Has the Friesian boom come to stay?" It is not a boom. Indeed, we have been slower to realise the worth of the Friesian than any other dairying country. Comparatively we have but a handful of the breed in Australia. In New Zealand the Friesians lead the way. In America, as is well known, they have done wonderful things, and it is no exaggeration to say that they are the most popular breed. In England they are making great headway.

It is difficult to keep up to date in recording the performances of Friesian cows. No sooner is one record made than it is broken. It is

not so long ago that we were astonished to learn that a Friesian calf had sold for £2,000. Then came the announcement that a six-months' old bull had sold for £20,000. Sales of heifers at £3,000 and £4,000 each is quite a common thing in American Friesian circles. These top figures are not got by the small farmer, but there is plenty of evidence that well-bred, high-testing cows find ready sale at around £200 each.

What is the reason for this prosperity? In the first place, of course, the breed has established some remarkable records. Several cows have made over 40 lb. butter per week. One cow has a record of over 50 lb. of butter per week—think of it! But that is not the only reason. The main reason is that dairymen are finding the Friesian a prepotent bull, a bull that can transmit to his heifers his superior milk inheritance. As one writer on the subject has said: "The Friesian breed has proved itself supremely adapted to the up-building of the scrub cow. This was demonstrated by the series of experiments carried on at the Iowa station. One cow averaged 3,255 lb. of milk and 161 lb. of butterfat during the year. Her daughter, sired by a Holstein bull, produced 6,311 lb. of milk and 261 lb. of butterfat. Her gain over her dam was 94 per cent. in milk and 62 per cent. in butterfat production. These daughters were bred again to Holstein sires, and their daughters produced an average of 11,295 lb. of milk, or a gain of 245 per cent. over their granddams, and their butterfat production was 431 lb. or 168 per cent. more than that of the old cows. The practical farmer usually begins with a purebred sire, and perhaps one or two purebred cows. He will find that the breed for him to choose is the breed that is so strongly developed along the line of production that the offspring of the sire when mated to common cows will be endowed in no uncertain manner with the ability to produce."

We have far to travel in Australia, but we have started on the way, and, as far as this paper is able to judge, the future of the breed is in good hands.—"Farm Bulletin."

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## GREAT FRIESIAN SALE.

Great prices were seen at a Friesian sale held in England on 5th September, the sum of £20,674 being obtained for the eighty-seven lots offered. The beautiful imported cow Golf Sietske 10th made top price, 4,500 guineas, to Mr. A. S. Bowlby, of Harlow (England). This cow has every attribute of a champion and breeds beautiful stock, while she startled Friesian circles by yielding 6 gallons in one day with her first calf. The price is higher than that made by any female in Great Britain and equals that paid for the most expensive bull in the golden days of the Shorthorn.

# FARMERS' WOOL CLIP.

## ADVANTAGES OF SKIRTING AND ROLLING.

By R. WILSON, Assistant Instructor in Sheep and Wool.

(*Continued from December issue.*)

A properly prepared clip is one in which all lines are even and regular, which facilitates full values being paid for the various types.

The reason a fleece is skirted is to allow the buyers to get what they want without having to take wools unsuitable for their requirements.

If a wool were very seedy or burry, it would be better to skirt off the very rough and scraggy edges, for if you were to skirt off all seed and burr from a very burry fleece, all that would be left would be the back with a small proportion of side, which would be cutting into your fleece wool too heavily.

The treatment necessary for all wools is to skirt as lightly as possible without leaving the low quality wools on the fleece, in respect of which the owners must use their own discretion, as the conditions vary so much under which different clips are grown. If the fleeces are but lightly touched with seed or burr, effective skirting will do away with that objection so far as concerns the fleece.

Stained wool, such as ewe breach stains caused by urine, or canary-yellow stained wool peculiar to certain districts, must be removed.

The pieces skirted off should be carefully picked over, and if the number of sheep should warrant it, be sorted into broken pieces and stains; the broken, to contain the bright, light-conditioned, bulky pieces, while the pieces would consist of the small, duller, and heavier-conditioned pieces. The stained wool should be kept by itself. In a small, or farmers' clip, it is only necessary to make one line of pieces, with stains removed.

As the necks of most fleeces are generally lighter in condition and bulkier than the pieces, they could be packed separately in a large clip, but such treatment could not be recommended for a small grower on account of cutting up his already small lines.

In all cases, belly wool should have the stains removed and be packed separately. The practice of packing belly wool with both fleece wool and pieces is far too prevalent, even with small clips of otherwise good quality. Belly wool is not used for the same purpose as fleece wool; therefore, there is no reason why a grower should deprive himself of the competition in that section of the trade which buys wool for the highest purpose of manufacture and pays most for suitable wools.

## ROLLING.

The advantage gained by rolling fleece wool is that it gives the wool a better appearance when opened up for exhibition.

The method of rolling is to first throw out the fleece on the wool table with *skin* side down, when it is skirted as required and side-folded over across the table to the roller. Then turn in the neck and breach, and roll from breach to shoulder, at the same time tucking in the back and edges of the fleece, when you can tie by drawing out of the shoulder enough wool to turn and tuck into the fleece, when the latter will be found to hold together as rolled.

When rolled, the shoulder, which is the best wool of the fleece, should be showing.

Care must also be taken that the pressers do not break the fleeces in carrying them from the bins to the press, unless such wool is to be scoured before being offered for sale. If they were allowed to be broken, it would nullify the object for which they were rolled. The treatment of crossbreds is much the same as in merinos. The larger the clip the greater the opportunity offered for effective work in connection with skirting.

The owner must at all times be guided by the size of his clip, but, be the clip ever so small, different qualities should be packed in different bales.

Therefore, the advantage of skirting and rolling can readily be seen, as it tends to increase competition and to ensure better values for the grower when opened up for sale.

## A BEGINNER WITH SHEEP.

A correspondent of the "Journal of Agriculture of South Australia" who states that he is a "green" Englishman owning about 700 acres of land in South Australia, divided into three fields, each about 200 acres in extent, and a home paddock of 20 to 30 acres, proposed to adopt a rotation of fallow, crop, feed, the sandhills of the fallow paddock to be sown during the following year to a forage crop, say, peas or barley (fully 30 acres), half of the feed paddock to be sown to oats and barley for early feed, and 20 tons of hay to be reserved for hand-feeding, if necessary, in dry seasons. The small paddock (a low-lying flat) he proposes drilling with oats and wheat mixed for hay this season, and broadcasting lucerne.

The Director of Agriculture (Professor Arthur J. Perkins), to whom this communication was referred, replies:—"I am afraid that if I were to deal adequately with all the points raised by you in your letter, my reply would run the risk of going into volumes. I cannot pretend, therefore, to more than make a few general remarks on the subject.

"In the first place, it is quite impossible for anybody to give you any idea of the number of sheep you can carry on a farm, unless the person advising you has personal experience and knowledge of the farm in question. If you are quite without experience in the management of sheep, one point of advice that I certainly can give you is not to aim at maximum, or anywhere near maximum, carrying capacity. A beginner should always understock, and never incur the risk of overstocking. Your best method, in the absence of previous experience, would be to secure a small flock of ewes, and gradually build up, increasing your flock as your experience becomes greater. Probably, in your case, fifty ewes would not be out of the way; but I should hesitate to handle a greater number at the outset. In a general way, of course, young ewes are to be preferred to cast old ewes, chiefly because the older ewes will need to be fattened off comparatively early, otherwise they run the risk either of dying or of becoming unsaleable from the difficulty of adequately fattening, but with present prices, and the difficulty of securing sheep at reasonable rates, I am of the opinion that you should take advantage of any sound-mouthed ewes you can secure at reasonable rates. You should give preference to large, well-developed sheep, selecting for the purpose either merinos or crossbreds, and unless your fencing is faultless, I certainly recommend merinos. Any type of English rams would suit your purpose—for fat lambs, Southdowns, Shropshire, or even Leicester. The main point is, that the ram should be well bred. You should endeavour to secure a two-tooth ram; older ones are always less satisfactory.

"In the matter of hand-feeding, I am of the opinion that you will often find grain more advantageous to feed to sheep than chaff; I refer to oats or barley grown as a second crop after wheat, which itself had been grown on bare fallow. Grain is easily handled and distributed to sheep, and is not liable to be blown about by the wind, as is the case with chaff. Bear in mind, however, if you are driven to hand-feeding, that you should not delay hand-feeding operations until your paddocks are bare. Hand-feeding, if likely to be necessary, should be anticipated a couple of months before it becomes actually necessary; it will enable you to stretch out the feeding capacity of your fields, providing the sheep with both concentrated food and roughage, which is more or less essential to them."

## AUSTRALIAN HONEY SUPPLIES.

Something like 3,000 tons of honey are stored in Australia, mostly on speculators' account (says the Sydney "Daily Telegraph"), awaiting export. The authorities, however, will not make shipping space available for honey, though the prospects of the position in this respect being relieved are now rather brighter.

Mr. Mears, general manager of the Coastal Farmers' Co-operative Society, and president of the Chamber of Commerce, states that, if shipping space were granted, honey could be shipped to London on consignment, and would be assured of ready sale at high prices. The C.F.S. has been advancing shareholders 7d. per lb. on their honey while awaiting shipment, which, of course, is considerably in advance of the rates for local sales, and compares with the 4d. to 4½d. paid some months ago by speculators.

PLATE 4.—ROOTS GNAWED BY RABBITS.

(An illustration of the extremities these animals will go to when pressed for food. Found by His Excellency the Governor during a recent tour.)

# Poultry.

## REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, NOVEMBER, 1918.

Another very trying month for egg production has been experienced. A nice shower of rain fell about the middle of November, but it has left very little trace owing to its being followed up by hot winds, which have been prevalent throughout the month. All the single test pens have now been removed to the new site. The following group pens have also been removed:—Messrs. Trapp, Carey, Whitman, Cheswell, Davies, Shaw and Stevenson, Stephens, Oldham, Mrs. Kurth, and the Progressive Poultry Pens. The group pens must evidently appreciate their change in location for the improvement in their output and general appearance is very marked. Broodiness has hampered the results in the case of some of the pens. In some cases fully one-half the occupants of the pen have spent a part of the month in the broody coops. G. Hindes's pen takes the first place for the month's laying in the light section, and D. Fulton's in the heavy section. Unfortunately, D. Fulton's F bird, which has been laying so well all along, has gone broody. There has been very little sickness to deal with. The following are the individual records:—

| Competitors. | Breed. | Nov. | Totsl. |
|---|---|---|---|
| LIGHT BREEDS. | | | |
| *Dixie Egg Plant ... ... ... | White Leghorns ... | 132 | 1,137 |
| *G. W. Hindes ... ... ... .. | Do. ... ... | 138 | 1,052 |
| *E. Chester ... ... ... ... | Do. ... .. | 118 | 1,049 |
| *Tom Fanning ... ... ... ... | Do. ... ... | 137 | 992 |
| *Geo. Prince ... ... ... ... | Do. ... .. | 122 | 989 |
| *C. P. Buchanan ... ... ... ... | Do. ... ... | 119 | 989 |
| *W. Becker ... ... ... ... | Do. ... ... | 132 | 984 |
| *G. H. Turner .. ... ... ... | Do. ... ... | 126 | 984 |
| *G. Howard ... ... ... ... | Do. ... | 90 | 975 |
| *Mrs. L. Henderson ... ... ... | Do. ... ... | 119 | 960 |
| *W. Lyell ... ... ... ... .. | Do. ... .. | 126 | 952 |
| *C. Knoblauch ... ... ... ... | Do. ... ... | 93 | 945 |
| *E. A. Smith ... ... ... ... | Do. ... ... | 127 | 943 |
| *Oakland Poultry Farm ... ... ... | Do. ... .. | 124 | 938 |
| *L. G. Innes ... ... ... ... | Do. ... ... | 121 | 930 |
| *R. Holmes ... ... ... ... | Do. ... ... | 111 | 924 |
| *Dr. E. C. Jennings ... ... ... | Do. ... ... | 130 | 896 |
| *O.K. Poultry Yards ... ... ... | Do. ... ... | 113 | 894 |
| B. Caswell ... ... ... ... | Do. ... ... | 110 | 885 |
| *Quinn's Post Poultry Farm ... ... | Do. ... ... | 107 | 881 |
| *Range Poultry Farm ... ... .. | Do. ... ... | 124 | 871 |
| J. J. Davies ... ... ... ... | Do. ... ... | 119 | 858 |
| *Thos. Taylor ... ... ... ... | Do. ... ... | 129 | 851 |
| *Mrs. A. T. Coomber ... ... ... | Do. ... ... | 117 | 840 |
| Harold Fraser ... ... ... ... | Do. ... | 128 | 835 |
| *Homalayan Poultry Farm ... ... | Do. ... ... | 117 | 816 |

## EGG-LAYING COMPETITION—*continued.*

| Competitors. | Breed. | Nov. | Total. |
|---|---|---|---|
| **LIGHT BREEDS—*continued.*** | | | |
| *J. M. Manson | White Leghorns | 121 | 809 |
| *J. Zahl | Do. | 116 | 803 |
| *C. Porter | Do. | 88 | 796 |
| Mrs. L. F. Anderson | Do. | 114 | 775 |
| O. W. J. Whitman | Do. | 98 | 772 |
| *Mrs. R. Hunter | Do. | 126 | 766 |
| Mrs. A. G. Kurth | Do. | 119 | 754 |
| *J. W. Newton | Do. | 104 | 740 |
| H. B. Stephens | Do. | 113 | 727 |
| S. Wilkinson | Do. | 102 | 726 |
| *T. B. Hawkins | Do. | 81 | 724 |
| Shaw and Stevenson | Black Leghorns | 119 | 721 |
| Geo. Trapp | White Leghorns | 123 | 715 |
| R. T. G. Carey | Do. | 70 | 710 |
| H. F. Britten | Do. | 112 | 703 |
| G. Williams | Do. | 97 | 700 |
| Progressive Poultry Pens | Do. | 107 | 686 |
| B. Chester | Do. | 118 | 673 |
| P. O. Oldham | Do. | 113 | 666 |
| W. A. Wilson | Do. | 104 | 626 |
| A. W. Walker | Do. | 96 | 613 |
| **HEAVY BREEDS.** | | | |
| *Nobby Poultry Farm | Black Orpingtons | 113 | 1,015 |
| *D. Fulton | Do. | 139 | 908 |
| *E. Morris | Do. | 117 | 903 |
| *A. E. Walters | Do. | 95 | 896 |
| *E. F. Dennis | Do. | 79 | 888 |
| *R. Burns | Do. | 123 | 879 |
| T. Hindley | Do. | 93 | 871 |
| *Mars Poultry Farm | Do. | 86 | 843 |
| *W. Smith | Do. | 114 | 802 |
| *W. H. Reilly | Chinese Langshans | 93 | 800 |
| A. Shanks | Black Orpingtons | 102 | 777 |
| *J. W. Macrae | Do. | 117 | 776 |
| E. M. Larsen | Do. | 85 | 758 |
| T. W. Lutze | Do. | 103 | 713 |
| *F. A. Claussen | Rhode Island Reds | 82 | 623 |
| W. J. Mee | Black Orpingtons | 67 | 615 |
| H. Puff | Rhode Island Reds | 71 | 558 |
| Jas. Fitzpatrick | Do. | 77 | 539 |
| Totals | ... | 7,126 | 53,739 |

* Indicates that the pen is engaged in single test competition.

## RESULTS OF SINGLE HEN TESTS.

| Competitors. | A. | B. | C. | D. | E. | F. | Total. |
|---|---|---|---|---|---|---|---|
| **LIGHT BREEDS.** | | | | | | | |
| Dixie Egg Plant | 173 | 186 | 203 | 175 | 193 | 207 | 1,137 |
| G. W. Hindes | 211 | 174 | 162 | 178 | 170 | 157 | 1,052 |
| E. Chester | 183 | 173 | 163 | 191 | 171 | 168 | 1,049 |
| T. Fanning | 174 | 155 | 183 | 129 | 177 | 174 | 992 |
| Geo. Prince | 149 | 179 | 162 | 176 | 156 | 167 | 989 |

RESULTS OF SINGLE HEN TESTS—*continued.*

| Competitors. | A. | B. | C. | D. | E. | F. | Total. |
|---|---|---|---|---|---|---|---|
| LIGHT BREEDS—*continued.* | | | | | | | |
| C. P. Buchanan ... ... ... | 148 | 167 | 167 | 168 | 177 | 162 | 989 |
| W. Becker ... ... ... | 168 | 167 | 145 | 180 | 149 | 175 | 984 |
| G. H. Turner ... ... ... | 110 | 140 | 180 | 177 | 207 | 170 | 984 |
| Geo. Howard ... ... ... | 155 | 159 | 168 | 176 | 156 | 161 | 975 |
| Mrs. L. Henderson ... ... | 172 | 138 | 163 | 127 | 181 | 179 | 960 |
| W. Lyell ... ... ... ... | 163 | 171 | 169 | 151 | 148 | 150 | 952 |
| C. Knoblauch ... ... ... | 166 | 149 | 175 | 150 | 141 | 164 | 945 |
| E. A. Smith ... ... ... | 135 | 180 | 162 | 167 | 162 | 137 | 943 |
| Oakland Poultry Farm ... ... | 140 | 154 | 171 | 170 | 156 | 147 | 938 |
| L. G. Innes ... ... ... | 166 | 179 | 199 | 103 | 117 | 166 | 930 |
| R. Holmes ... ... ... | 168 | 170 | 145 | 150 | 136 | 155 | 924 |
| Dr. E. C. Jennings ... ... | 135 | 183 | 160 | 138 | 154 | 126 | 896 |
| O.K. Poultry Yards ... ... | 141 | 159 | 167 | 132 | 158 | 137 | 894 |
| Quinn's Post Poultry Farm ... | 181 | 133 | 189 | 119 | 175 | 134 | 881 |
| Range Poultry Farm ... ... | 70 | 184 | 128 | 161 | 159 | 169 | 871 |
| Thos. Taylor ... ... ... | 115 | 157 | 145 | 130 | 150 | 154 | 851 |
| Mrs. A. T. Coomber ... ... | 130 | 159 | 139 | 147 | 107 | 158 | 840 |
| Homalayan Poultry Farm ... | 166 | 141 | 122 | 113 | 149 | 125 | 816 |
| J. M. Manson ... ... ... | 169 | 151 | 168 | 107 | 97 | 117 | 809 |
| J. Zahl ... ... ... ... | 169 | 130 | 155 | 149 | 120 | 80 | 803 |
| C. Porter ... ... ... ... | 112 | 133 | 149 | 137 | 110 | 155 | 796 |
| Mrs. R. Hunter ... ... ... | 122 | 150 | 74 | 126 | 146 | 148 | 766 |
| J. W. Newton ... ... ... | 141 | 169 | 81 | 104 | 136 | 109 | 740 |
| T. B. Hawkins ... ... ... | 147 | 108 | 140 | 112 | 102 | 115 | 724 |
| HEAVY BREEDS. | | | | | | | |
| Nobby Poultry Farm ... ... | 193 | 173 | 156 | 113 | 186 | 194 | 1,015 |
| D. Fulton ... ... ... ... | 178 | 145 | 145 | 139 | 104 | 197 | 908 |
| E. Morris ... ... ... ... | 135 | 137 | 168 | 177 | 160 | 126 | 903 |
| A. E. Walters ... ... ... | 129 | 169 | 120 | 173 | 169 | 136 | 896 |
| E. F. Dennis ... ... ... | 174 | 140 | 137 | 89 | 188 | 160 | 888 |
| R. Burns ... ... ... ... | 132 | 149 | 124 | 134 | 188 | 152 | 879 |
| Mars Poultry Farm ... ... | 148 | 159 | 130 | 145 | 130 | 131 | 843 |
| W. Smith ... ... ... ... | 192 | 143 | 76 | 132 | 114 | 145 | 802 |
| W. H. Reilly ... ... ... | 135 | 161 | 137 | 92 | 118 | 157 | 800 |
| J. W. Macrae ... ... ... | 97 | 107 | 153 | 119 | 148 | 152 | 776 |
| F. A. Claussen ... ... ... | 111 | 108 | 94 | 115 | 116 | 79 | 623 |

## LATE-HATCHED CHICKS.

By J. BEARD, Poultry Instructor.

Now that the hot weather is with us, the late-hatched chicks require a lot of extra attention and care, and if not attended to, the mortality will be very great. It is the late-hatched chicks, through lack of attention, that are the cause of many diseases that occur in the poultry yard by feeding too much animal and over-heating foods and allowing their drinking water to be exposed to the sun and become hot and stagnant.

Breeders who have taken my advice not to hatch any chicks after September will now be reaping the benefit, and some of their earliest-hatched pullets should now be shelling out. Compare them with the ones hatched in October, November, and December, if the owners are successful in rearing 50 per cent. of their hatches. When will they commence to lay? In March, April, May, June, and July, when eggs begin to drop in price. This is the kind of management that is the cause of

many failures in poultry farming, which should be worked on the same basis as any other branch of farming, *i.e.*, that the first crop is always the most profitable, requiring the least labour and expense in producing. When the poultry farmer commences to realise this, then he has something to look forward to and admire when he realises that the early hatched chicks are the ones that give the best returns, not alone from a laying point of view, but also with respect to the high prices he secures for his surplus cockerels in the market when he gets in early, not having to wait until the market is glutted and the returns are below normal.

With further reference to the drinking water: As I have previously mentioned, in many cases this is the sole cause of many troubles with poultry. Probably more diseases are spread through drinking water than in any other way. Impure water should not be allowed within reach of fowls. It is no uncommon sight on poultry farms, otherwise well kept, to find the vessels in a filthy condition or exposed to the sun's rays. To put clean water in dirty receptacles is a waste of time, yet I often see on poultry farms and in back yards dirty or unclean vessels containing green-scummed water. Carelessness of this kind is almost certain to result in heavy losses. The drinking water should be the best obtainable, such as we would be willing to drink ourselves, since it plays a most important part in the make-up of the fowl, and of the egg. I prefer the tap or creek water to the tank rain water, as the former is mineralised and the latter is not. Water tins should be cut so that they can be easily cleaned every day; and every week they should be cleaned and scalded or rinsed with some good disinfectant. I would also advise that a tonic be given twice a week, in the way of Douglas's Mixture, more particularly during moulting season. This can be made as follows:—Pour half a gallon of boiling water on to half a pound of copperas (sulphate of iron). When cold, add one ounce of sulphuric acid and stir well. When cold, the mixture can be put into bottles. Add one tablespoonful of the mixture to each quart of water as directed above. Care should, however, be taken not to put it in tin or iron vessels. Use earthenware or enamelled. I would also advise that one tablespoonful of kerosene once a week be added to half a kerosene tin of drinking water, this not only acts as a preventive, but is also a cure for many contagious and intestinal diseases. For roup or gapes it has no equal as a preventive.

Late-hatched chickens, at this time of the year, are susceptible to chicken-pox. The disease is both contagious and infectious. If proper attention be given in regard to cleanliness and feeding, this disease can be checked or avoided altogether. Maize in any shape or form should not be fed to young chickens, as this mode of feeding causes the birds' temperature to rise, and chicken-pox is sure to follow. The method advised during the hot weather is to feed a mash of bran and pollard mixed with either cold water or milk, and scalded wheat alternately, the latter to be given when cold. Every third day add one tablespoonful of sulphur to the mash in sufficient quantity to feed forty adult fowls; this to be given on a warm day. In adding the sulphur, the best plan is to put the sulphur into a bowl and crush to a fine powder. Then add a couple of handfuls of pollard, and mix thoroughly and add to the bulk. By adopting these means, the sulphur is evenly distributed and not left lumpy, and every bird gets its equal share. Epsom salts should be given once a week in their mash, but not on the same day as the sulphur is given. Dissolve one packet in the water you mix the mash with. One packet is sufficient for twelve adult fowls. Dry, flaked bran in tins or hoppers should always be available for the chickens to pick from, together with a good supply of grit, or charcoal, and green food when procurable.

For outward treatment of chicken-pox, bathe the head once a day with a weak solution of boracic acid, and smear the affected parts with a mixture of sulphur and zinc ointment. Ordinary washing blue made into a paste has a very gratifying effect on mild cases.

*Enteritis.*—This is a very common disease among poultry, and is caused by uncleanliness, foul drinking water, putrid meat food, and filthy or rotten food of any kind, the presence of unslaked lime, or continual diarrhœa. This disease is contagious, and it spreads rapidly through the flock and is responsible for many deaths. In diagnosing this disease, the bird will appear listless, the comb will be dark in colour, and the shanks shrivel up, and the evacuations are of a bilious character.

Treatment:—Quarantine all affected birds and give each one two teaspoonfuls of castor oil; two hours afterwards give ten drops of chlorodyne, and should the excreta not harden in from six to eight hours, give another five drops of chlorodyne. Feed on boiled rice and give scalded milk to drink. Clean and disinfect thoroughly all houses and yards, and burn all dead birds and accumulated rubbish. Keep a sharp look out for any other birds that may become affected. This can best be done by going to the roosts a couple of hours after roosting-time and examining the droppings and removing any affected birds, which should be treated as directed.

# Tropical Industries.

## THE SUGAR SEASON, 1918.

From the annual report of the General Superintendent of Sugar Experiment Stations in Queensland to the end of October, 1918, we take the following notes on the results of the crop for that year:—

1.—The anticipations in last year's report that Queensland would manufacture some 346,000 tons of sugar were not realised. This was due to three causes:—

(*a*) Mills being delayed for want of lime and bags due to industrial strife in the Southern States;

(*b*) To an early and abnormal wet season in many districts preventing an extension of the crushing into February; and

(*c*) The cyclone at Mackay.

The tremendous crop of last year was due to several causes, the chief being the large amount of standover cane from 1916 and the extremely favourable growing weather of 1917. Although the full tonnage was not secured, the 1917 crop was easily the best that Queensland has yet seen, the total amount of raw sugar manufactured being 307,714 tons or 64,877 tons in excess of the last record year—viz., 1913. In reality some 313,000 tons of raw sugar were made, but approximately 6,000 tons were destroyed in the January cyclone at Mackay and the floods which accompanied that disaster. But for shipping delays last year, the whole of the sugar would have been removed and this great loss would not have occurred. It should remain an object lesson on the advantages of the rapid getting away of sugar stocks before the wet season sets in. Fortunately, this year no stocks have so far accumulated. It is seldom that a good season is experienced in all the sugar districts at the same time, but this happened both in 1913 and 1917. Practically every mill was supplied to its utmost capacity or over-supplied.

The yield of Queensland sugar in 1917 taken with that produced in New South Wales exceeded the consumption by about 60,000 tons. This amount is held in stock by the Federal Government, the purchasers of the sugar; and every pound of it will probably be needed to make up the deficiency that will occur in this year's crops.

### 2.—Approximate Estimate of the 1918 Cane Crop.

At the commencement of the present year the outlook for another large yield of sugar was highly promising, and it was generally anticipated that, if not a record, the year would approach its predecessor very closely. The severity of the cyclones at Mackay, Babinda, and Innisfail, floods in these and other districts, severe frosts from Mackay southward, and an entire absence of favourable growing weather have operated to so large an extent that the estimated surplus will now result in a shortage. At Mackay the cane suffered quite as much from the terrific rainfall in January and February as from the cyclone itself, the fall for six weeks amounting to 91 inches, the greater part of which fell during the cyclone week. Portions of this district have also been more or less severely affected by frost. At Babinda and Innisfail the cane was much farther forward at the time of the cyclone in March than it was in the January cyclone at Mackay, and suffered a great deal more damage from the actual wind. The cane on the Herbert River and Proserpine did not suffer nearly so much from the cyclonic blows, but rain and floods interfered a great deal with its growth. At Cairns and Mossman the want of suitable canegrowing weather has largely reduced the crops, the climatic conditions having been too cool. On the Lower Burdekin there was an immense crop in the early part of the year, a large proportion of which was standover, but owing to long-continued dry weather a great part of this died. It was at one time doubtful if all the cane in the district could be crushed this year, but it is generally anticipated now that the whole of it can be treated. At Bundaberg and Childers the crops are better than elsewhere, but the severe frosts experienced at the former place have also led to a reduction in the sugar yield at that place.

The following are the estimates of the amount of cane to be crushed as supplied by the various mills during the present month; they are, of course, only approximate at this stage. A rough approximate estimate made in March is also furnished to show the falling-off:—

| Mill. | Rough Approximate Estimate made in March. | Approximate Estimate in October, furnished by the Mills. | Remarks. |
|---|---|---|---|
| | Tons. | Tons. | |
| Mossman .. .. | 62,000 | 54,000 | |
| Babinda .. .. | 95,000 | 112,000 | |
| Hambledon .. .. | 85.000 | 70,000 | |
| Mulgrave .. .. | 70,000 | 58,000 | |
| South Johnstone .. | 50,000 | 55,000 | |
| Goondi .. .. | 60,000 | 50,000 | |
| Mourilyan .. .. | 35,000 | 40,000 | |
| Victoria .. .. | 100,000 | 85,000 | |
| Macknade .. .. | 100,000 | 80,000 | |
| Kalamia .. .. | 150,000 | 96,000 | |
| Pioneer .. .. | 140,000 | 110,000 | |
| Inkerman .. .. | 160,000 | 130,000 | |
| Proserpine .. .. | 63,000 | 58,000 | Part from the Lower Burdekin. |
| Plane Creek .. .. | 38,000 | 35,000 | |
| Homebush .. .. | 40,000 | 34,000 | |
| Cattle Creek .. .. | 35,000 | 30,000 | |
| North Eton .. .. | 30,000 | 24,000 | |
| Marian .. .. | 65,000 | 35,000 | |
| Farleigh .. .. | 35,000 | 25,000 | |
| Racecourse .. .. | 35,000 | 24,000 | |
| Palms .. .. | 19,000 | .. | Cane sent to Pleystowe. |
| Pleystowe .. .. | 53,000 | 43,000 | Including Palms cane. |
| Baffle Creek .. .. | 7,000 | 7,000 | |
| Miara .. .. | 2,000 | .. | Closed down. |
| Waterloo .. .. | 5,000 | 2,680 | |
| Qunaba .. .. | 55,000 | 50,000 | |
| Millaquin .. .. | 80,000 | 65,000 | |
| Bingera .. .. | 75,000 | 55,000 | |
| Fairymead .. .. | 90,000 | 84,000 | |
| Gin Gin .. .. | 26,000 | 24,000 | |
| Invicta .. .. | 20,000 | 13,100 | Loss by frost estimated at 7,000 tons. |
| Doolbi .. .. | 35,000 | 25,000 | |
| Isis Central .. .. | 45,000 | 48,000 | |
| Childers .. .. | 90,000 | 107,000 | |
| Maryborough .. .. | 20,000 | 13,000 | |
| Mount Bauple .. | 32,000 | 26,500 | |
| Moreton .. .. | 25,000 | 16,000 | |
| Logan and Nerang .. | 20,000 | 15,000 | |
| Totals .. .. | 2,147,000 | 1,801,280 | |

The above figures are approximate only. Taking the tons of cane at 1,801,280, and assuming that the average tons of cane required to make 1 ton of sugar will be 8¾, then a yield in the region of 206,000 tons of sugar should be realised, providing matters run smoothly till the end of the crushing season. This will be about 101,000 tons less than last year. The price of raw sugar remains at £21 per ton, so the value to Queensland should be £4,326,000. Taking the output of New South Wales and Victoria (beet) at 20,000 tons, this would give the yield of Australian sugar at 226,000 tons. This is in terms of raw sugar. The approximate shortage would be somewhere about 57,000 tons, taking the consumption as given recently by the Commonwealth as 283,000 tons. This figure is largely in excess of the last two years and evidently accounted for by the large export of sugar in jam.

NOTE.—Since the above estimate was in type some of the Mackay mills have closed for the season with a still smaller tonnage than they anticipated, so it is probable that the yield of sugar will be even less than 206,000 tons.

## THE SUGAR INDUSTRY IN THE PROSERPINE AND BUNDABERG DISTRICT.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report from the Field Assistant, Mr. J. C. Murray:—

"Throughout the month the districts of Proserpine and Bundaberg have been visited, the latter place including the sub-districts of Woongarra, Barolin, Bucca, Sharon, Gooburrum, South Kolan, Avondale, and Invicta.

"In my last report I mentioned having dealt with a portion of Proserpine. There is a good deal of uniformity about this district, and, generally speaking, remarks that apply to one farm apply to the whole.

"The weather has been very dry, though an occasional thunderstorm has occurred within the last four months; previous to this period, however, heavy floods had been experienced.

"The soil about Proserpine is heavy and dark, with fair quantities of humus and acidity fairly pronounced.

"Some farmers at Proserpine are using tractors with satisfactory results. There is a tendency to overload these machines, however, by compelling them to drag more discs than they are rated for. The average soil resistance would be about 25 lb. throughout the district.

"The rat pest is the worst the farmers have to contend with in the Proserpine, though up to the present these have not given much trouble.

"In planting in this district I notice the farmers usually place their rows about 5 feet apart and their plants about 8 inches deep. In some cases the grower places about 2 inches of covering on his plants and others more, according to their individual opinion. In soil such as prevails at Proserpine it is not a good practice, however, to cover too heavily.

"It is a general practice here to burn the trash prior to cutting. The cutters have done their work in these fields fairly well, very little cane being left on the ground.

"It would be to the advantage in this district generally if the farmers did more subsoiling than they are doing. Most of the growers do excellent cultivation, but in many cases they do not go deep enough.

The types of plough in use principally are the ordinary discs. Weeds are kept down between plants by scuffling. It is noticeable that most of the successful farmers go well down when ratooning.

"The growers in the Proserpine district are not troubled much with noxious weeds, the worst being the Burdekin grass. Nut grass is evident in small quantities.

"In the Bundaberg district the canegrowing prospects are fair for next cutting. The soil, principally a red volcanic, is fairly free from weeds and acidity, the latter not being so pronounced as in the northern areas.

"Farmers have been going in a great deal lately for lime and green manures. This is gratifying, because the land wants lime especially.

"The weather has been very dry around Bundaberg until the last few weeks, when several bursts of rain fell.

"The principal varieties growing are D 1135, 1900 Seedling, Badila, and Clark Seeding. The firstmentioned, however, is still the most extensively grown. There are some farm areas, however, where D 1135 could be replaced to advantage by other canes, preferably Badila. This cane does well on the Hummock Plantation, where a 60-ton crop was a fine illustration of what can be grown on land carefully worked and cropped. Quantities of lime (about 30 cwt. to the acre) and green manure (Mauritius Bean) were used, with the above results.

"In planting in the Bundaberg districts the farmers mostly use the cane planter. The rows are about 5 feet apart, the plants about 8 inches deep, and 12 inches between

plants. Planters usually place their plants on a hard bottom and cover lightly with a farm implement. Farmers do not change their plants much in these cane areas.

"Fertilisers are not being used to any great extent, as results, so far, have not justified the expenditure in time and labour.

"Practically all drainage is done on the Bundaberg district farms by surface drains. There is no irrigation.

"The ploughs in common use here are the discs. Horses are mostly used, one or two planters only having mechanical traction.

"Most of the cultivators used here are fitted with hoes. These appear to be the best for the soil conditions. Ploughing is not done extensively between the rows. It was not noticeable that much damage had been done to the roots of the plants through cultivation.

"It is difficult to arrive at an average cost of cultivation, as so many of the farmers' estimates vary.

"Farmers usually burn their trash before cutting. In one or two instances have farmers volunteered ratoons, but not with satisfactory results.

"Labour conditions are fair throughout the Bundaberg district. Most of the work is done by local men. Whenever this class of labour is available there is seldom much trouble.

"Matters are unsatisfactory for the farmers at Bucca and Invicta, they having no milling accommodation closer than Bingera. Many of the growers are thinking of leaving the industry and going in for other sorts of farming."

## TO REPAIR A LEAKY GALVANISED IRON TANK WITH A CAPACITY OF 10,000 GALLONS OR THEREABOUTS.

Mr. Arthur Morry, Surveyor, Department of Agriculture and Stock, advises:—

Carefully clean out the inside of the tank by removing all grease, dirt, and corroded incrustations; but this must be done carefully or the holes will be enlarged.

In a tank of this size, both inside and outside should be cemented, especially if the holes are numerous. It is not then necessary to stop the holes with any special stopping, as the cement compo when laid on will pass through the holes on to the outside and will form a much better key than if they had been stopped.

Commence with the inside, and after cleaning as above described, give the sheets a coating of cement-wash (pure cement and water), about the thickness of cream, starting at the top and working down about 3 ft. at a time. Then, before this is quite dry, fill in all the corrugations with a compo consisting of one part cement to one and a-half parts of clean, sharp sand. Proceed in this way to the bottom, then, as soon as possible, begin again at the top and lay on a coat three-quarters of an inch thick of one cement and one and a-half sand, and finish off with a wood or steel float.

Cover the bottom of the tank with wire netting about 1-inch mesh, and before finishing the sides turn up some strips of netting at intervals against the sides and cover them with cement. Then cover the whole of the bottom with three-quarters of an inch of compo as before, and well work it with a wood or steel float. Run a fillet about 1½ inch wide all round at the intersection of the side and bottom.

To make a thorough job of a tank of this size, the outside should then be treated in the same way, which will make the walls of the tank about 2¼ inches thick and very durable. Thirty-two bags of cement and about three yards of sand will be required to do both sides and bottom. Nineteen bags of cement and two yards of sand for inside and bottom only.

To line a 1,000-gallon tank as above, one side only, two casks or six bags will be required with half a load of sand.

# Science.

## REPORT ON INVESTIGATIONS IN REGARD TO THE SPREAD OF PRICKLY-PEAR BY THE SCRUB TURKEY.

By G. B. BROOKES, Instructor in Agriculture, Rockhampton.

The Scrub Turkey having been suspected by several observant settlers in pear-infested country of being the medium for carrying and distributing the seed of the prickly-pear, Mr. G. B. Brookes, Agricultural Instructor for the Central District, was deputed by the Department of Agriculture to fully investigate the matter, and report the results. Mr. Brookes has now furnished the following report on the subject:—

Although particulars have already been supplied covering a period dating from the inception of the inquiry, my remarks will, in this instance, embrace the whole of the work carried out.

The following are the principal points included in the scope of the inquiry:—

1. Are the turkeys large consumers of pear fruit?
2. Are the seeds wholly digested by the birds?
3. What proportion of the seeds taken respectively from the crop, gizzard, and intestines, and those passed by the birds, germinate in comparison to those secured from the ripe pear fruit?

The findings arrived at are:—

### 1. ARE THE TURKEYS LARGE CONSUMERS OF PEAR FRUIT.

The appearance of the birds received by the restaurants in town suggest that they feed largely on pear fruit, as evidenced by the purple stains on the head and feet. It may be of interest to mention that their method of securing the fruit is to fly over the plants, seizing the fruit in their claws while on the wing, then dropping it in a heap some yards distant. Quite a number of those collections were to be seen around scattered pear clumps.

To obtain definite proof that the turkey consumed large quantities of pear fruit, six birds were shot in a pear-infested scrub lying between Stanwell and Westwood. Those birds were carefully opened, the quantity of seed secured from the respective birds being as follows:—

QUANTITY OF SEED SECURED FROM SIX TURKEYS.

| Turkey No. | 1. | 2. | 3. | 4. | 5. | 6. | Totals. |
|---|---|---|---|---|---|---|---|
| Crop | 147 | 101 | 315 | 245 | 0 | 190 | 998 |
| Gizzard | 180 | 180 | 170 | 35 | 160 | 240 | 965 |
| Intestines | 67 | 0 | 126 | 0 | 70 | 0 | 263 |
| Totals | 394 | 281 | 611 | 280 | 230 | 430 | 2,226 |

### 2. ARE THE SEEDS WHOLLY DIGESTED BY THE TURKEY.

In a previous report prominence was given to this most important point, so that, when visiting scrub areas infested with pear and where turkeys were numerous, close search was made around their feeding places, and also adjacent to nests, to ascertain whether the birds rejected the seeds in their droppings. Regarding this matter, I may mention that I interviewed several farmers who were emphatic in their assertion that the turkey was guilty of spreading the pear, but their only proof was the fact that the birds consumed the fruit and that the pear was spreading in the scrubs.

An excellent opportunity was, however, afforded of securing reliable data on this point from the fact that a turkey was to be found in captivity in the Rockhampton Botanic Gardens. Mr. Simmonds, the curator, very kindly arranged to supply this bird with ripe pear fruit and note results. Although two sugar-bags of fruit were consumed, no seeds were to be found in the droppings or on the surface of the soil in the small enclosure.

The fact that seed was to be found in the intestines of three of the birds examined is undoubtedly suspicious, but as those were in every instance in close proximity to the gizzard, it is very probable that they were ejected by that powerful organ when the bird was shot.

The following extracts from communications received by Mr. P. V. Maloney, Secretary, Native Birds Protection Society, Rockhampton, bearing on this point, are of interest, viz.:—

From Mr. H. C. Macarthney, Gogango: "I have taken pains to thoroughly examine those birds shot in the district and find that they are at present largely feeding on the fruit of the pear. On opening them up I found the crop and gizzard full of pear seeds, but apparently nothing passes the powerful crushing gizzard, as all matter in the intestines was reduced to a paste."

From Mr. P. F. Macdonald, The Range, Rockhampton: "I have during the past sixty years, while I lived at Yaamba, continued to rear and make pets of these valuable birds (turkeys), and carefully watched the result, and always found them quite harmless of the charges attributed to them (spreading pear)."

### 3. GERMINATION TESTS CARRIED OUT WITH PEAR SEED.

Tests were made with those obtained from the crop, gizzard, and intestines of the six birds, as well as from seeds obtained from ripe pear fruit. Seeds that had passed through the turkey were not to be found. Each lot of seeds was kept separate in the tests. The results have been tabulated, however, according to the respective organs.

Two methods of testing were adopted—viz., blotting paper "tray tester," and under ordinary soil conditions. Ten seeds were taken from each lot for the "tray tester," the balance being planted in a plot of land shaded by the branches of an adjacent tree, and protected from vermin by bird netting. No rain having fallen since the commencement of the test, frequent waterings had to be resorted to, the soil being kept moderately moist.

For comparison, a test was carried out in both tester and soil with seed obtained from ripe pear fruit. This was of interest as it is generally believed that pear seeds will not germinate for years unless they have passed through the digestive tract of an animal or bird.

RESULTS OF GERMINATION TESTS.

Commenced 22nd July, 1918, to date 20th November, 1918.

| Percentage Germinating. | | Sept. | Oct. | Nov. | Total. | Grand Total. |
|---|---|---|---|---|---|---|
| Crop.. .. | Tester .. .. | 2 | 24·0 | ·4 | 30·0 | Crop .. 14.5 |
| | Soil .. .. | .. | ·9 | 4·7 | 13·7 | |
| Gizzard .. | Tester .. .. | .. | 1·6 | 3·4 | 5·0 | Gizzard.. 6·7 |
| | Soil .. .. | .. | 5·9 | 1·0 | 6·9 | |
| Intestine .. | Tester .. .. | .. | .. | .. | .. | Intestine 0·7 |
| | Soil .. .. | .. | 0·8 | .. | 0·8 | |
| Check— (Pear Fruit) | Tester .. .. | .. | 85·0 | 5·0 | 90·0 | Check .. 62·5 |
| | Soil .. .. | .. | 46·0 | 10·5 | 0·56 | |

Attached herewith is a photograph of the tray tests taken on the 29th of October.

It was noted that a large proportion of the seeds obtained from the gizzards and intestines were considerably worn down, many being chipped and broken. To this fact may be attributed the low germination so far recorded of the seeds taken from those organs.

### DEDUCTIONS ARRIVED AT.

It will be noted from the investigations carried out that the scrub turkey is not, as alleged, an active agent in spreading prickly pear. However, should evidence be forthcoming to the contrary, it will be carefully inquired into.

In regard to the germination tests, unless advised to the contrary, those will be discontinued at the end of the present month.

## GENERAL OBSERVATIONS.

In carrying out the soil tests, it was noted that when the plants were about an inch high the leaves were eaten off, by what agency I was unable to ascertain.

It was also noted that the young seedlings are very delicate. Exposure to sun and high temperature shortly after germination will cause them to shrivel up close to the soil and fall over, the leaves remaining green for some time after.

When the enormous crop of pear fruit that is produced annually is taken into consideration, the fact that the seed germinates readily is of interest. Much of this seed is transported over considerable stretches of country by floods and heavy rains. Fortunately, a very large proportion of the resultant plants must perish shortly after germination, the factors abovementioned contributing largely to this end.

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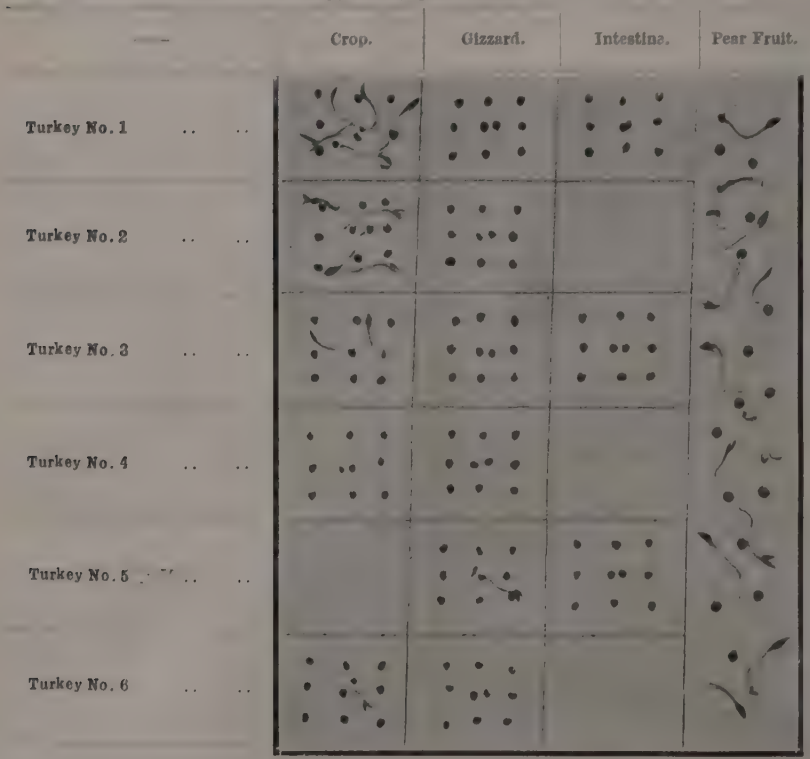
GERMINATION TESTS WITH PRICKLY-PEAR SEEDS FROM SCRUB TURKEYS AND RIPE PEAR FRUIT.

Test commenced 11th July, 1918; photographed 29th October, 1918.



# Entomology.

## CANE GRUB INVESTIGATION.

The General Superintendent of the Bureau of Sugar Experiment Stations has received the following report on Cane Grub Investigation, by Dr. J. F. Illingworth, Entomologist to the Bureau:—

"The extended drought is having a serious effect upon the cane in the Cairns District. Most of the late planting is barely holding its own, while cane planted early in the season is showing serious drying of the lower leaves.

"In some cases, where the fields were all prepared, planting has been so long delayed by the dry weather that they will not be put in this season. This has a rather serious aspect with regard to our investigation, for I was anxious to get the results from a number of these late-planted areas. However, we may be able to get results from what is already in, if the weather becomes favourable for growth and continued cultivation.

"CULTIVATION AS A CONTROL MEASURE FOR GRUBS.

"As has been demonstrated, cultivation during the period that the beetles are active seriously interferes with the laying of their eggs. Hence the value of the late planting, which permits thorough cultivation right through their ovipositing period.

"Let me urge, then, that the cultivators be kept active in every infested field, wherever it is possible to get through the cane. It is important to do this work even though the ground is clean; and it should begin not later than two weeks after the first beetles emerge. It will be well to go over the ground at least every two weeks as long as the beetles are in evidence.

"As indicated in my previous report, it may be profitable to start the preparation of the land which is to be planted early (April-May). The ploughing, harrowing, and so forth, will undoubtedly have a deterrent effect upon egg-laying in these new fields. They do not like freshly-ploughed ground, especially if it is devoid of grass and trash. Definite observations by growers on these points will be appreciated, for they may save us a lot of detailed experiment.

"EXCHANGE OF PARASITES.

"Since the breeding of our parasitic wasps belonging to the genus *Campsomeris* was so successful under artificial conditions, it has occurred to me that these insects might be very valuable if liberated in countries where they were free from their natural enemies. These foes are so abundant here that the wasps are scarcely able to make themselves felt in the open, though they breed very prolifically. Vast numbers of their young are destroyed by secondary parasites, and the adults that do escape probably often fall a prey to the numerous fly-catchers which are present here.

"Since Australia is the native home of numerous beetles of the family *Scarabaeidæ*, with great range in size, this is a fertile field for the development of parasites; but, unfortunately for our own interests, this parasitism has advanced to the hyperparasitic stage, *i.e.*, the parasites are themselves attacked by other parasites. It is a well-recognised fact, however, that insects introduced into new countries where they are freed from their natural enemies, for a time multiply by leaps and bounds if the climate is suitable for them.

"White grubs are becoming increasingly important in sugar-growing countries, and it behoves us to work together for their control.

"Our experience with these wasps has been that they are not limited to any particular species of grub, for they are apparently able to adapt themselves to a

considerable range in size. Then, too, transportation to foreign countries will be rather simple, since the wasps have a rather extended pupation period.

"We are hoping that we may get some relief by the introduction of parasites —at any rate, it is worth making the attempt. We are in correspondence with various sugar-growing countries with this end in view. We certainly stand ready to reciprocate if our wasps are needed elsewhere.

"EMERGENCE OF BEETLES, 1918.

"The long drought has delayed this emergence in many districts, so that it is possible that many will not come out at all. Sections favoured by the rains last month got a crop of beetles at once. About 2 inches fell around Babinda on the night of 15th October, and the next day the greybacks were out in force. On the 19th, at dusk, I found the feeding-trees swarming with beetles; one scrub had nothing but green beetles, *Callodea punctulatus;* others had all three species of *Lepidiota—albohirta, caudata,* and *froggatti,* in almost this order of abundance. There were cane lands alongside, and the shrubs were in a grass field.

"NOTES ON *LEPIDIOTA FRENCHI.*

"Changes take place in the grubs of this species during October. Both second and third stage grubs are in cells during the cool weather; but as the hot days come on the second-stage grubs moult, changing to the third stage, and begin their destructive feeding. At the same time, the third stage pupate. Hence it is seen that this species spends a full year in the third larval stage. It is shortly after the beginning of this stage that the insects do their worst damage to sugar-cane, as indicated in our reports published in the 'Sugar Journal' for December, 1917, and January, 1918.

"Fortunately, this species only troubles new land, for the beetles do not favour the laying of their eggs in old fields, preferring blady grass."

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## ANOTHER IMPORTED PEST.

The ravages of the lucerne seed chalcid wasp in the Pallamawalla district have been investigated by Mr. W. W. Froggatt, Government Entomologist, and in his report to the Minister for Agriculture he makes recommendations for combating the pest.

Mr. Froggatt says that this chalcid wasp was originally a native of the United States, and was introduced into New South Wales with imported lucerne seed. It has for some years past greatly reduced the yield of lucerne seed in the Tamworth district. It was first noticed in Pallamawalla about three years ago, and for the last two years has increased very rapidly and has done a great deal of damage. The tiny black wasp punctures the immature seed, and deposits her eggs beneath the skin, under the protection of which the baby larval wasp feeds, grows, and finally pupates. The perfect wasp emerges from the pupa by cutting a hole through the skin of the lucerne seed.

At the time of the Entomologist's visit no wasps could be found about the lucerne flowers, but any waste seed in the thresher or sheds contained a percentage of parasitised seeds in the pupal form, from which the perfect parasites were at any time ready to emerge.

Experiments carried out by the lucerne growers have shown, says Mr. Froggatt, that if the first summer cut is burnt, the next cut can be allowed to ripen for seed. His advice is that if the first cut is made before the seed is more than half-grown, and allowed to dry for lucerne hay, it will not be necessary to burn it, as the immature wasp larvæ will die as the seed withers in haymaking.

# Animal Pathology.

## REPORT ON MR. MUNRO HULL'S CLAIMS REGARDING TICK-RESISTING CATTLE.

BY DR. T. HARVEY JOHNSTON and MISS M. J. BANCROFT, B.Sc., Biology Department, University, Brisbane.

In the September, 1912, number of this journal, Mr. G. W. Munro Hull, of Eumundi, North Coast line, called attention to the existence of a tick-resisting condition in a certain number of the cows forming his dairy herd, such animals remaining free from tick infestation whilst the remainder were regularly attacked. He believed that this peculiarity was caused by the presence in such animals of some tick destroying microbe, and that it was possible to convey the resistant quality to other animals by vaccination of the latter with some of the "lymph" occurring chiefly on the escutcheon of resistant animals. It was stated that such cows did not require to be sprayed or dipped since they remained sleek and clean-coated whilst the untreated stock suffered from tick attacks. The vaccinated animals were liable to invasion by tick larvæ, but the latter nearly always died soon afterwards. Only on rare occasions did any reach maturity and lay eggs, but such eggs had not been found to hatch. Even when such animals were turned out into open country for months at a time they maintained their resistance, whilst ordinary cattle under the same conditions became heavily infested, some dying of tick worry, even though food was abundant. Mr. Hull also suspected that the resistant condition was hereditarily transmitted.

The Agricultural Department purchased two cows, "Clover" and "Tinkerbell" (specially selected by Mr. Hull as examples of his resistant stock), in order to test the correctness of these claims. Since the latter were more specifically stated by him at a later date, we might briefly summarise the list published as a parliamentary report in the latter part of 1914:—

"1. That these cattle never mature more than a few odd female ticks during the course of a year—a total of from 50 to 100 per year being the highest estimate, though the animals are regularly infested (naturally) by myriads of larvæ, the majority of which die while still very minute.

"2. That as a result of such freedom from developing ticks, these cattle do not require any attention as regards ticks, and may be turned out on any country for indefinite periods without experiencing tick worry, and consequently present a clean sleek appearance.

"3. That this peculiarity is transmissible to other cattle by 'contact' (*i.e.*, natural infection) and by vaccination, and is transmitted in every case to the progeny of such animals, but does not manifest its presence in the offspring until after the first year of life.

"4. That the material used for vaccination (*i.e.*, the exudate occurring on the escutcheon of resistant stock) is not produced as a result of excessive tick worry.

"5. That the comparatively few female ticks which are to be found maturing on such animals have become displaced without injury from other cattle and have reattached themselves to the resistant stock.

"6. That though these ticks may lay eggs, no larvæ develop from them, though eggs laid by ticks taken from control cattle readily hatch.

"7. That a few ticks are to be seen at odd times on resistant animals during winter, when other cattle are free from them.

"8. That such animals have a markedly higher temperature than other cattle during winter."

In 1914 Mr. C. J. Pound, director of the Yeerongpilly Experimental Station, as a result of his observations regarding the two cows purchased by the Government, reported adversely on Mr. Hull's claims. He stated:—

"1. That after having been placed in a ticky paddock for twenty-seven days, the two cows matured large numbers of ticks.

"2. And that they became so badly infested and tick-worried that dipping or spraying would have been justified.

"3. That he had not been able to transmit the alleged peculiarity to other cattle either by contact or by vaccination, while the calf of one of the two animals was commonly more or less heavily tick infested.

"4. That the exudation was caused by tick attacks.

"5. That cattle ticks only very rarely, and then with the greatest difficulty, reattach themselves while maturing.

"6. That there is no difference in regard to the rapidity of hatching of eggs laid by ticks taken from the two experimental cows and those laid by ticks from other cattle.

"7. That there is practically no difference between the nature of the infestation of the so-called resistant animals and that of ordinary cattle during either the winter or summer months.

"8. That the difference in temperature reported by Mr. Hull did not occur."

It will thus be seen that Mr. Pound disagrees with all Mr. Hull's claims. The latter were in part restated in 1915 before the Select Committee of the Legislative Assembly, and another claim was added—viz., that the application of an arsenical dip or wash temporarily suppressed the tick-resisting peculiarity.

Mr. Hull has recently modified (in a letter), as a result of further observations, certain of his claims (Nos. 1 and 3 in this report) to a slight extent, and now states that the number of ticks (50-100) given as being carried per year by a resistant animal, is in many cases excessive; that some of the ticks, in addition to the few that mature, instead of dying whilst very minute, as most of them do, continued to develop but die before undergoing engorgement; that certain cases of apparently hereditary transmission are really due to contact; and that in one case the exudate made its appearance in a calf during the first year of life.

It appears to us that the most important points to be ascertained are—

1. Whether tick-resistance actually occurs—*i.e.*, whether there are cattle which, when placed under conditions of natural infestation, do not become infested to the same degree as other animals similarly situated.

2. Whether the degree of resistance is sufficiently marked so that very few, if any, ticks mature on such animals which, as a consequence, do not require dipping or other treatment to prevent tick worry.

3. Whether resistance depends on breed, food, climate, &c.

4. Whether the resistant condition (if present) can be transmitted in any way.

5. Whether an exudation of serum or lymph occurs locally on resistant animals; and whether such is merely a form of tick sore.

Tick resistance might be manifested by—

(*a*) A failure to develop any ticks belonging to a particular species; such would be an example of tick immunity.

(*b*) A tendency towards light infestation when ordinary controls become heavily infested.

(*c*) A failure on the part of female ticks to become fully matured or engorged in such numbers as on controls when under the same conditions of climate.

(*d*) A failure of such engorged ticks either to lay a normal number of eggs or to lay eggs showing a normal percentage of hatchings.

In regard to (*a*), we know that some ticks are very restricted in regard to suitable hosts, *e.g.*, the cattle tick (*Boophilus australis* and related species and varieties) thrives on cattle and occurs naturally on horses and occasionally on sheep and certain other animals, but it is essentially a parasite of cattle. Other species are not so restricted—*e.g.*, various species of *Ixodes*, including our coastal scrub tick *I. holocyclus*. Some must leave their host to undergo certain stages of development, and then must reattach themselves to some suitable host which may belong to quite a different group of animals—*e.g.*, the red-legged cattle tick (*Rhipicephalus sanguineus*) which is occasionally found on horses, cattle, and dogs in South-eastern Queensland. The cattle tick, however, passes through all its stages on the one host animal. It is common knowledge amongst graziers and dairy farmers that there exist in many herds animals which are more or less resistant to tick invasion. For some reason such beasts are distasteful to ticks, and, consequently, the larvæ either do not attach themselves or else, having become attached, they only occasionally develop to maturity.

We have interested ourselves in the question of tick resistance of cattle, and have endeavoured to collect all the information that we could regarding the condition. With this end in view we have visited a number of farms where resistant stock were to be found and have given special attention to the animals which at present form, or previously formed part of, Mr. Hull's herd. We have inspected them on many occasions during 1915-1918, while during the present year (1918) one of us accepted the offer of hospitality from Mr. and Mrs. Hull in order to make a detailed study of the cattle for a prolonged period (January-February, March and June), when all the engorged ticks to be seen on resistant animals were carefully collected, most of the cattle being examined both morning and afternoon, whilst the non-milkers were usually inspected once daily.

The following is the result of our thorough collecting from a number of resistant cows during a period of twenty-seven consecutive days in the height of the tick season (January and February, 1918):—Cow No. 1, nil; No. 2, 3; No. 4, 3; No. 5, 2; No. 6, 0; No. 7, 4; No. 8, 13; No. 9, 0; No. 10, 30; No. 11, 16; No. 12, 0; No. 13, 1. Nine were taken from No. 14 in twelve days, and sixty-four from No. 15 in twenty-seven days. The last animal is regarded by Mr. Hull as a non-resistant cow.

Nos. 7, 9, 14, and 15 are young animals. Excluding No. 10, only thirteen fully matured ticks were removed from nine cows during the whole period, and even if we include No. 10, then the total is only 27. It may be urged that these figures only prove that ticks were extremely scarce on the property at the time, but that such was not the case was shown by the occurrence of fairly heavy infestation of a number of control heifers from another district, which were then being depastured with Mr. Hull's herd. No stronger evidence could be brought forward to prove the presence of a very marked tick resistance in these animals. Many others were carefully, but not so systematically, examined, and most of these showed the presence of resistance.

We have placed ourselves in communication, as far as possible, with those who have had any experience with Mr. Hull's stock, and have taken the opportunity to examine many of them elsewhere.

In practically all cases the animals retained their resistance even when moved to other districts, provided that they maintained fair or good condition, and, as a consequence, did not require any treatment to prevent tick worry—in other words, under conditions of natural infestation, our observations have led us to agree with Mr. Hull's contentions numbered in this report as Nos. 1, 2, and 3.

It may be urged that departmental findings in regard to the two selected cows are exactly the opposite to our own. We have, as already stated, had Mr. Hull's animals under intermittent observation for three and a-half years, and under the closest observation for a period greater than the normal parasitic period of the cattle tick. Mr. Pound's findings are no doubt correct when the animals were subjected to abnormal circumstances, *e.g.*, poverty of condition, intense artificial infestation, &c. When these same two animals were allowed their freedom under conditions which permitted only natural infestation, the published evidence associated with the names of Messrs. Corser and Walker, MM.L.A., Chambers, Bates, and Butcher has satisfied us that Mr. Hull's claims were correct in regard to these two animals also. One of them, "Clover," just before death, became heavily infested, but this is only what one might expect, as with old age comes a lowering of condition and a lessening of resistance to any disease, including tick invasion.

Those who are interested in the matter are invited to peruse a somewhat lengthy communication on "A Tick-resistant Condition in Cattle," which is being published in the "Proceedings of the Royal Society of Queensland" (1918, *p.* 219- ). This article deals with tick worry, habituation of cattle to tick infestation, tick poison, tick resistance, conditions affecting such resistance, and the transmissibility of the peculiarity. All the evidence that we have been able to collect is there summarised.

We have carried out a series of observations with engorged ticks from resistant animals with a view to testing the fertility. We found that from the eggs laid by such ticks the percentage from which larvæ were obtained was considerably smaller than in the case of ticks from control animals. The percentage of those whose eggs did not develop into larvæ was the same in both cases, whereas the percentage of partial fertility was much greater, and of practically complete fertility was much less, than in the case of controls. In other words, not only did very few ticks mature on such animals, but there was also some impairment of the vitality as shown by the lessened number of viable eggs (Claim No. 6). We endeavoured to artificially infest a resistant animal to a moderate degree, but without success.

We disagree with Mr. Hull's opinion (Claim No. 5) that the ticks on resistant cattle have developed on other animals and reattached themselves to such resistant

animals. In regard to the few ticks which Mr. Hull states (Claim No. 7) are to be found in winter on such animals when other cattle are free, we believe the explanation to be as follows:—The cows which come under closest observation are the milkers, and as a result of being in milk, such animals during winter frequently fall into somewhat low condition, which brings about a diminution of their tick-resisting powers. On the other hand, resistant cows when dry seldom become infested.

We took the temperatures of a number of resistant animals during the summer, and found them to be approximately normal. We think that a similar result would be obtained by registering the temperatures during the winter also (Claim No. 8).

In an article published in this journal (1918, vol. 9, pp. 171-2) we called attention to the presence of tick resistance in cattle, and invited correspondence regarding the effects of breed, food, dipping, condition, &c. A number of replies were received from various districts.

Brahmin cattle and crossbreds are more or less strongly resistant. In Queensland, tick resistance is not confined to any one breed, though apparently more common amongst Jerseys and Jersey crosses, perhaps on account of the presence of fine short hair and rather oily skin. Individual animals of various other breeds, Shorthorn, Ayrshire, Holstein, Hereford and their crosses may possess a marked resistance. We are inclined to believe that it is to some extent a matter of individual idiosyncrasy. We think that food has an influence only to this extent: that animals in good condition are commonly less infested than those in poor condition. It may be urged that such animals are in good condition because they are not tick worried, but it is undoubtedly also true that an animal in good health is less liable to invasion owing to its natural resisting powers being then most marked.

Resistant animals have been noted in a number of localities, extending from the Atherton Tableland to Springbrook Plateau, more usually in the vicinity of scrub country—perhaps the more abundant fodder in such situations helping to maintain condition and resistance.

Evidence has been collected in favour of, as well as against, the view that the application of arsenical solutions suppresses resistance. We are inclined to think that, provided the condition of the animals be not lowered by the treatment, suppression or diminution of resistance does not happen.

### Transmissibility of Resistance.

Mr. Hull claimed that it could be transmitted hereditarily, by vaccination, and by contact—*i.e.*, that it could be naturally acquired. Mr. Pound's observations did not uphold any of these claims.

We have carefully collected all the evidence available in regard to the herds of Messrs. M. and F. Hull (Eumundi), Mr. Inigo Jones (Crohamhurst) and others. As a result, we believe that resistance in certain cases is a quality capable of hereditary transmission. This does not mean that all the progeny of such cattle will be resistant. It is necessary to know how the parental stock acquired the peculiarity. We have not obtained sufficient information to allow us to state whether it is of a Mendelian character. It is possible that certain cattle may really be "sports" as far as resistance is concerned, and, in such cases, the quality would be transmissible to a percentage of the offspring. We would like to obtain more informtaion regarding the result of mating a resistant bull with resistant and non-resistant cows, so as to enable us to decide what part (if any) heredity plays.

There is considerable evidence in favour of the view that resistance can be transmitted to other animals by vaccination, *i.e.*, by using some of the exudate (to be referred to later) from resistant cattle. We have not succeeded in so transmitting it to any of our experimental animals.

Mr. Hull, when speaking of transmission by "contact," means to infer that the condition is picked up naturally by means of the larvæ which hatch from eggs laid by ticks from resistant cattle, conveying "something" derived from such animals to those which they infest, and thereby setting up resistance. Our experiments were unsuccessful. We also failed to find in the exuudate any organisms other than those whose presence resulted from contamination. In this we agree with Mr. Pound's findings. Moreover, there are many animals which have been on Mr. Hull's property in company with resistant animals for periods varying from one to seven years without becoming resistant.

We, however, believe that in most cases the condition is naturally acquired as a direct result of moderate, long-continued infestation, which causes the production of an anti-tick substance in the blood and other fluids of certain cattle. In other words, we believe that the tick actually injects minute quantities of a poison (tick poison), and this stimulates the blood (just as the injection of other foreign substances does)

to manufacture an anti-tick substance which neutralises the poison. We have found an anticoagulin in the cattle tick, and it is known that similar poisons occur in several other ticks, which, on injection, give rise to various symptoms, but if recovery occurs, then an immunity, or at least a resistance, follows.

We think that habituation is a step towards such resistance, and that the condition is slowly acquired as a result of tick attack. Some cattle-owners assert that if animals remain undipped for a season, then the animals will either die of tick worry or else become resistant. This is perhaps correct, but in view of the greater probability of the former event happening, we think that dipping, in conjunction with a rotation of paddocks, should be systematically carried out, in order to control the tick pest and assist in its eradication.

### EXUDATE.

Associated with tick resistance there may be an exudate (Hull's Claim No. 4 in this Report) which we have already described in the pages of this Journal (May, 1918, p. 172). It consists of drops of a clear yellow fluid, which appear on the skin on various parts of the body, neck, dewlap, butt of tail, and escutcheon, notably on the lastnamed, where it is more evident owing to the shortness of the hair. These drops become thick and sticky, ultimately forming little granular masses of thin flat yellow scabs, according to the size of the original drop. The largest patches seen were about the size of a sixpence or slightly larger. In some animals these little masses of exudate are perfectly clear, the skin appearing through them quite uninflamed. In others some blood may be present, and then the resulting scab is discoloured. When dry, these scabs are readily flaked off, leaving a rounded area of smooth clean skin beneath. There is no positive evidence to prove that each patch of exudate is caused by the bite of a tick, though, occasionally, larval ticks have been found attached to a dry scab, having become entangled in the sticky fluid. This exudation of lymph must be due to one, or both, of two causes—(1) either a slight mechanical injury to the tissue which, while not usually penetrating a blood capillary, allows an escape of lymph from the tissues; such might be caused by the larval tick inserting its rostrum, and then withdrawing it and going elsewhere; (2) or to an increase in the blood pressure, involving an extravasation of lymph from the capillaries. The formation of small hard lumps on the flanks and in the vicinity of escutcheon and neck of resistant animals, upon the centre of which a patch of fresh exudate may or may not appear, would be accounted for by an increase in blood pressure, since, when scored, blood flows very freely from such lumps. The affected area is rather irritable, the cows showing a desire to lick or rub the part. This exudation makes its appearance particularly during the warmer months( October to June), especially during the moist weather.

The condition just described appears to graduate into a type of tick-sore, so far only noticed on resistant animals. The scab formed over such a tick-sore consists of two very distinct parts—an outer ring of a clear yellow substance, apparently composed of exactly the same matter as that spoken of above, surrounding a dark blood-stained core on the upper surface of which there is a pit where the mouth parts of a tick have been inserted, while very often the tick is still present. Development up to the adult stage occurs in such ticks, but the females are unable to bloat and remain stunted, sickly-looking individuals, eventually dropping off with the scab. The under-surface of this hard black core, surrounding the rostrum of the tick, often contains pus. When such a scab is removed a corresponding pit is seen in the skin of the beast.

Although we have failed to find even larval ticks in the great majority of the patches of exudate examined by us, even after using the microscope, we believe that they are a direct result of larval tick attack on certain cattle, *i.e.*, cattle which possess some individual physiological peculiarity. Such animals are resistant, and apparently the small quantity of tick toxin—perhaps even the mere mechanical stimulus caused by the insertion of the rostrum—is able to so increase the local blood pressure that there is an exudation of lymph. We have already stated our opinion that the blood of resistant animals will be found to possess certain differences in regard to its biochemical composition.

It may be objected that this exudate makes its first appearance each season before the presence of ticks is noticed, but we must point out that larvæ begin to infest cattle some little time before their occurrence is noted by an ordinary observer.

We, then, agree with Mr. Pound in regard to this claim that the condition is the result of tick attack, but we disagree with him when he regards it as an ordinary tick-sore. We agree with Mr. Hull that it is not the result of irritation caused by excessive tick worry.

Commenting upon the preceding report, Mr. C. J. Pound, Government Bacteriologist, makes the following remarks in a communication to the Under Secretary, Department of Agriculture and Stock:—

During the past six years Mr. Hull, in his numerous reports to the Department and the public Press, has been most persistent in such statements as:—

> "It is absolutely impossible for cattle ticks to live more than a couple of days, and in no case have I known a tick to develop on any of these specially treated animals."

> "If carefully watched, these ticks will in a couple of days be found to be merely dry scales which fall off, leaving no trace of their existence. It sometimes happens that a full-grown tick will adhere to one of these treated cattle, and the result is the same."

> "I can show you thousands of larval ticks swarming on these proof cattle to-day, and in a week's time show you nothing but dead pupa with an occasional half-matured female, while the ordinary cow, if left unsprayed, will in three weeks' time be heavily infested with mature ticks."

> "The cattle that have contracted this disease come into the yard smothered with tiny ticks, which duly adhere; but in a couple of days they may be scraped off as dry shells, and in no case do they ever mature as they do on other cattle."

According to the report under review, Mr. Hull has modified these claims, and now contends—". . . . . that some of the ticks, in addition to the few that mature, instead of dying while very minute, as most of them do, continue to develop, but die before undergoing engorgement . . . ."

As engorgement rarely takes place before the twentieth day, these ticks must have developed and survived the second moult on the animal.

In this connection, the fact must not be lost sight of that dead ticks in various stages of development are frequently found on ticky cattle, no matter what the degree of infestation.

The authors state that—"Under conditions of natural infestation our observations have led us to agree with Mr. Hull's contentions numbered 1, 2, and 3 in this Report."

*With regard to No.* 1.—The observations as conducted on the question as to the number of ticks found on cattle at Mr. Munro Hull's farm at Eumundi must be regarded as only of relative value compared with the definite and positive results obtained by Messrs. Watson and Carmody at Yeerongpilly, on which occasion the cattle were not artificially infested, the animals having been brought from a ticky paddock and placed in stalls for convenient and exact observations.

The number of ticks found on cattle running on ticky country is extremely variable and largely due to the conditions of environment. Gross tick infestation or so-called tick resistance is not by any means constant, *i.e.*, at variable periods a heavily tick-infested animal may become lightly infested, while a so-called resistant animal may become grossly infested, as demonstrated by the observations conducted at Maryborough and Yeerongpilly; hence it is obvious that at times the necessity arises to dip or spray these alleged tick-resistant cattle, which is a complete answer to No. 2.

*With regard to No.* 3.—No. 3 reads as follows:—"This peculiarity is transmissible to other cattle by contact (*i.e.*, by natural infection) and by vaccination, and is transmitted in every case to the progeny of such animals, but does not manifest its presence in the offspring until after the first year of life . . . ."

### Hereditary Transmission.

The authors, although their investigations cover a period of three and a-half years, do not mention having actually conducted experiments in order to determine whether the alleged tick resistance is transmitted by heredity, but have collected evidence from Mr. Munro Hull, Mr. F. Hull, Mr. Inigo Jones, and others, and as a result they state:—"We believe that resistance in certain cases is a quality capable of hereditary transmission."

### Transmission by Vaccination.

On the all-important question of transmission of tick resistance by vaccination, the authors state:—"There is considerable evidence in favour of the view that resistance can be transmitted to other animals by vaccination. We have not succeeded in so transmitting it to any of our experimental animals."

Further, with reference to transmission by contact, the authors again say:—"Our experiments were unsuccessful."

It is also of interest to note that they state:—"Mr. Pound's observations did not uphold any of these claims."

With reference to the development of ticks on so-called resistant cattle, the authors state that "during the months of January, February, March, and June all the engorged ticks to be seen on resistant animals were carefully collected, most of the cattle being examined both morning and afternoon, whilst the non-milkers were usually inspected once daily."

During January and February, 1918, the small total of 145 ticks were removed from fourteen cows in twenty-seven days, but no mention of the number of ticks collected during March and June, the latter being a mid-winter month, when, according to Mr. Hull, matured ticks are more numerous on the so-called resistant cattle.

As, presumably, this experiment was conducted largely with the object of determining accurately the total number of ticks that matured and became engorged on these alleged tick-resisting cattle, I am perfectly satisfied that careful examinations conducted even twice daily could not possibly reveal the total number of ticks that matured on these animals.

Observations of over twenty-five years have convinced me that in order to determine the total number of ticks maturing on any given animal such an animal must be kept in a stall under constant observation, for it is a well-known fact to those who are intimate with the life history and development of the cattle tick that at a certain stage ticks become rapidly engorged and fall off at any time during night or day. This was strikingly brought under notice during the following experiment:—

In May, 1914, "Clover" and "Tinkerbell," both in good condition, were placed in a ticky paddock (natural infestation) for twenty-seven days, then brought into stalls and kept under observation. Mr. H. B. Watson and Mr. Inspector Carmody were instructed to collect ticks as they matured. During this period of twenty-five days thirty inspections were made, and of the engorged female ticks collected 230 were picked off "Clover" and 860 from "Tinkerbell." The morning and afternoon inspections usually occupied about thirty minutes, but during the intervals a considerable number of ticks became engorged and fell off among the bedding, but such ticks were not included in the total.

In order to make the Yeerongpilly experiments more complete in some of the earlier observations, artificial infestation (by no means intense) was resorted to with a view of ascertaining if such ticks would mature and become engorged on the cows "Tinkerbell" and "Clover," but I must take exception to the author's statement that the animals ("Tinkerbell" and "Clover"), whilst at Yeerongpilly, "were subjected to abnormal circumstances, *e.g.*, poverty of condition, intense artificial infestation, &c."

These remarks are not from me, nor could such inference be drawn from any of my reports; on the contrary, the two cows, whenever in my charge during the past six years, have always been well fed and specially cared for, and not subjected to conditions likely to produce a lowered resistance. Further, in order to keep down gross tick infestation, the cows were sprayed periodically with other cattle.

It may be questioned why it is necessary to spray cattle running in paddocks at this Government institution. In reply, I may state that the various paddocks on this property lie practically in a basin surrounded on three sides by public roads and vacant land on which are running numbers of straying dairy cattle, the majority of which are, during the greater part of the year, grossly tick infested. The ticks from these cattle, with eggs and larval ticks, are washed by the storm waters into the two creeks that pass through the Station paddocks; hence the necessity for continual spraying of all the cattle on this property.

On the question of animals losing their power of alleged tick resistance through scarcity of feed, reference is made to the original cow "Clover," which, it is stated, just before death became heavily infested.

This is not borne out by Mr. Hull's report to the Department, dated 6th February, 1916, of which the following is an extract:—"Thus 'Tinkerbell' became so poor that she was so heavily infested under natural conditions that she failed to survive, whilst her companion 'Clover' (a hardy natured cow—Ayrshire) remained in condition in spite of severe weather, and at the same time held her powers of tick resistance."

In another report, dated 3rd February, 1916, Mr. Hull states that—"Owing to the severe drought, natural feed is scarce, and records show that one of the cows

('Tinkerbell') fell so low in condition that on 10th December she was heavily infested with fully matured ticks, whilst her companion (of a hardier constitution—Ayrshire) was perfectly clean and in good condition. 'Tinkerbell' was a grade Jersey. 'Tinkerbell' fell so low in condition as to succumb to an assault from another cow—a fate which befel more than one of my own cattle during the dry spell we are just recovering from.''

### Winter Ticks.

Mr. Hull claims—''That during the winter months these cattle will mature more female ticks than in the summer, when ticks are most active.''

This, Mr. Hull explains, is because these so-called resistant cattle have a higher normal temperature (1-2½ per cent.) during the winter months than they have during the summer months, thus confirming his idea ''that they possessed a temperature high enough to suit the tick, while the temperature of the ordinary cow in conjunction with the air temperature was too low for them.''

He further states—''I would like stockowners to know that I had long ago advised the Department that I had observed that, although these cattle carried no ticks during the summer, when ticks were most active, they always matured an inconsiderable number during the cold weather, when the ordinary stock were free from ticks.''

And again to quote Mr. Hull—''Out of the hundreds of such ticks taken from these proof cattle during the last three years not one of the thousands of eggs they laid (under observation) has ever hatched out.''

The presence of mature ticks during the winter months on what he terms his proof cattle is explained by Mr. Hull as having been ''picked up from other cattle after passing the pupa stage.'' Although the authors disagree with Mr. Hull on this question, their findings are based on temperatures of cattle recorded during the summer months only.

### The Influence of Food as a Factor on the Degree of Infestation.

The authors state that—''We think that food has an influence only to this extent —that animals in good condition are commonly less infested than those in poor condition. It may be argued that such animals are in good condition because they are not tick worried, but it is undoubtedly also true that an animal in good health is less liable to invasion owing to its natural resisting powers being then most marked.''

I entirely disagree with these views, for I have repeatedly observed that healthy, fat cattle from the Sydney and Brisbane shows are readily susceptible to tick invasion; moreover, they are not borne out by the years of experience of those who have closely observed good, healthy cattle on station properties and the constant arrival of healthy, tick-infested, fat cattle at our Northern meatworks.

### Exudate.

Under this heading, the authors state that ''the condition appears to graduate into a type of tick-sore, so far only noticed on resistant animals.''

Had these observations been wider, it would have been found that this condition is as readily observed on both so-called resistant and non-resistant animals, and, moreover, the serum exudes only from those parts of the skin which have been attacked by the young ticks, for when such cattle are dipped, or are freed from ticks by any other method, an almost simultaneous disappearance of the exudate will be readily observed. This exudate of serum which subsequently develops into a dry, hard crust, is a common occurrence on the cattle exposed to tick infestation at Yeerongpilly.

The cow ''Tinkerbell,'' with several of her progeny, and also some of the progeny of the cow ''Clover,'' are still under my control.

As a result of continued observation extending over five years, I cannot find any good reason for varying the opinions expressed in my report of 19th August, 1914.

I therefore strongly recommend that this report dealing with Mr. Munro Hull's claims be appended.

### Independent Observations on ''Tinkerbell'' and ''Clover,'' not under Departmental Control.

On 13th April, 1915, the brindle cow ''Tinkerbell'' (grade Jersey) and the black and white cow ''Clover'' (Ayrshire strain) were consigned to Messrs. Butcher and Rex, Maryborough, being loaned to the Wide Bay and Burnett Pastoral and Agricultural Society for over nine months for independent observations.

Various reports were published that these two cows remained free from ticks, while the cattle running with them were always grossly infested.

On 10th December the Hon. A. J. Jones, M.L.C., Messrs. Page, M.H.R., Dymock, and H. A. Jones inspected these two cows and found "Tinkerbell" was heavily infested with fully developed ticks, alive and ready to drop off

The Hon. A. J. Jones, M.L.C., in his evidence before the Select Parliamentary Committee, states that—"As a matter of fact, just above the udder, I do not think it was possible to prick the skin without touching a tick. She was what I call badly infested, and needed dipping or washing."

Some weeks later, Mr. Jones, the Secretary of the W.B.B.P.A. Society, informed me that "Tinkerbell" had died, and that the cow "Clover" would be returned on the 18th February.

On untrucking at Yeerongpilly, I was greatly surprised to find, not "Clover," but the cow "Tinkerbell." On careful search I failed to find any ticks, but ample evidence of recent heavy tick infestation; moreover, there was positive evidence that the cow had been recently treated with some arsenical compound.

### Conclusion.

The only experimental evidence brought forward by the authors in support of Mr. Hull's claims is that which endeavours to show that on some cows very few ticks will mature and become engorged; but, as I have pointed out elsewhere, the method of conducting these experiments was far from conclusive in obtaining a correct estimate of the number of ticks that matured on these cattle. When conducting an investigation of this character, the practical and commercial value of the results obtained must not be lost sight of, and in this respect the authors and myself have not been able to report favourably on Mr. Hull's propositions.

Though of some scientific interest, it must now be regarded as valueless as a practical means of dealing with the cattle tick pest, and consequently Mr. Munro Hull's alleged discovery cannot be considered as of national importance.

I have consistently emphasised that tick eradication can only be successfully carried out in any given section of country by systematic dipping or spraying of all cattle in a standard arsenical solution, or, where conditions are favourable, by the "pasture rotation method." I am therefore highly pleased to learn from their report that Dr. Harvey Johnston and Miss M. J. Bancroft, B.Sc., endorse my views on the subject.

## LINSEED ON THE DAIRY FARM.

We, in Australia, are much inclined to hold cheap those articles which are the production of our own factories, and to consider imported goods superior to ours. This idea is fast losing ground, and our eyes are being opened to the fact that Australian manufacturers can and do produce articles of clothing, machinery, foodstuffs, &c., which easily rival imported goods. Amongst these we may instance the product of the flax plant, and particularly of its seed, well known as the linseed of commerce. Linseed is well known as a valuable food for pet birds, but it has a far greater value in the commercial world, since it yields two valuable products—namely, Linseed Oil and Linseed Meal. A striking example of admirable goods manufactured in Australia is afforded by the group of Linseed products put forth by Messrs. Meggitt, Limited. Those who know anything about the painters' trade are familiar with the trade mark "The Little Boy from Manly," personifying young Australia, as the Linseed Oil in drums that he adorns is known to be the basis of the very best paints and colours to be had in Australia. But not alone is Meggitt's Linseed Oil appreciated by the painter. It has proved a benefactor to the farmer who considers the welfare of his horses, cows, sheep, pigs, and poultry, owing to the proved value of the Linseed meal products by reason of their digestibility, their palatability, and the nutriment they contain. For the dairy farmer they are especially valuable, particularly at a time like the present, when drought conditions deprive the stock of the natural and artificial pasture. The meal adds to the richness of the milk, and helps in keeping the animals in good heart, and in maintaining the health of the herd when food is poor. Oil meal supplies the farm horses with food on which they can do work. It will help the pigs to put on that fine, firm fatness and sleekness that counts for so much when "topping up" for sale. In brief, all animals benefit by this addition to their ordinary diet. When the grass is gone it will keep the sheep from starvation, and the poultry under this diet become early ready for market.

# The Markets.

## PRICES OF FARM PRODUCE IN THE BRISBANE MARKETS FOR DECEMBER, 1918.

| Article. | | DECEMBER. Prices. |
|---|---|---|
| Bacon | lb. | 9d. to 10½d. |
| Barley | bush. | 5s. 7d. to 6s. |
| Bran | ton | £7 5s. to £7 10s. |
| Broom Millet | ,, | £50 to £60 |
| Broom Millet (Sydney price) | ,, | £80 to £90 |
| Butter (First Grade) | cwt. | 172s. 8d. |
| Chaff, Mixed | ton | £9 to £10 |
| Chaff, Oaten (Imported) | ,, | £8 to £9 |
| Chaff, Lucerne | ,, | £9 to £13 15s. |
| Chaff, Wheaten | ,, | £7 10s. to £8 15s. |
| Cheese | lb. | 11d. to 11½d. |
| Flour | ton | £12 |
| Hams | lb. | 1s. 6d. to 2s. |
| Hay, Lucerne | ton | £8 to £10 |
| Hay, Oaten | ,, | ... |
| Hay, Wheaten | ,, | £7 to £8 15s. |
| Honey | lb. | 2d. to 3d. |
| Maize | bush. | 5s. 6d. to 6s. |
| Oats | ,, | 3s. 10d. to 4s. |
| Onions | ton | £15 to £16. |
| Peanuts | lb. | 7d. to 11d. |
| Pollard | ton | £5 |
| Potatoes | ,, | £11 to £27 |
| Potatoes (Sweet) | cwt. | 4s. 10d. to 5s. |
| Pumpkins (Table) | ton | £13 to £15 |
| Pumpkins (Cattle) | ,, | £9 to £12 |
| Eggs | doz. | 7d. to 8d. |
| Fowls | per pair | 2s. 3d. to 3s. 9d. |
| Ducks, English | ,, | 3s. to 4s. |
| Ducks, Muscovy | ,, | 3s. 6d. to 4s. 6d. |
| Geese | ,, | 4s. to 5s. |
| Turkeys (Hens) | ,, | 6s. to 16s. |
| Turkeys (Gobblers) | ,, | 12s. to 35s. |
| Wheat (Milling) | bush. | 4s. 6d. to 5s. 6d. |

## VEGETABLES—TURBOT STREET MARKETS.

| | |
|---|---|
| Asparagus, per dozen bundles | 5s. to 14s. |
| Beans, per sugar-bag | 5s. to 8s. |
| Beetroot, per dozen bundles | 1s. to 2s. |
| Cabbages, per dozen | 8s. 6d. to 12s. |
| Carrots, per dozen bunches | 1s. 6d. to 1s. 9d. |
| Cucumbers, per dozen | 6d. to 2s. |
| Lettuce, per dozen | 1s. 3d. |
| Marrows, per dozen | 2s. to 4s. 6d. |
| Parsnips, per dozen bunches | 1s. 6d. |
| Peas, per sugar-bag | 5s. 6d. to 12s. |
| Sweet Potatoes, per sugar-bag | 2s. 2d. to 3s. |
| Pumpkins (table), per cwt. | 13s. to 15s. |
| Tomatoes, per quarter-case | 7s. 6d. to 10s. 6d. |
| Chocos, per dozen | 1s. to 1s. 6d. |

## SOUTHERN FRUIT MARKETS.

| Article. | DECEMBER. Prices. |
|---|---|
| Bananas (Queensland), per case | 8s. to 13s. |
| Bananas (Tweed River), per bunch | 7s. to 15s. |
| Bananas (Fiji), per case | 20s. to 22s. |
| Bananas (G.M.), per bunch | 6s. to 7s. 6d. |
| Bananas (G.M.), per case | 20s. to 22s. |
| Cherries, per 12lb. box | 4s. to 7s. 6d. |
| Lemons, per case | 6s. to 8s. |
| Mandarins, per case | 8s. to 12s. |
| Mangoes, per bushel-case | 6s. |
| Oranges (Navel), per bushel-case | 20s. to 25s. |
| Oranges (Other), per case | 10s. to 11s. |
| Oranges (Queensland), per case | ... |
| Papaw Apples (Queensland), per bushel-case | 10s. |
| Passion Fruit, per bushel-case | 30s. |
| Peaches, per half-case | 5s. to 10s. |
| Pineapples (Queens), per case | 12s. to 14s. |
| Pineapples (Ripleys), per case | 12s. to 14s. |
| Pineapples (Common), per case | 13s. to 15s. |
| Tomatoes, per case | 20s. to 24s. |
| Strawberries, per box | 4d. to 9d. |

## PRICES OF FRUIT—TURBOT STREET MARKETS.

| Article. | DECEMBER. Prices. |
|---|---|
| Apples, Eating, per case | 15s. to 17s. |
| Apples, Cooking, per case | 16s. 6d. to 20s. |
| Apricots, per quarter-case | 8s. 6d. to 11s. 6d. |
| Bananas (Cavendish), per dozen | 1¾d. to 5½d. |
| Bananas (Cavendish), per bunch | 1s. 6d. to 5s. |
| Bananas (Sugar), per dozen | 2d. |
| Cape Gooseberries | ... |
| Cherries, per box | 8s. to 12s. |
| Cherries, per quarter-case | 18s. to 20s. |
| Citrons, per hundredweight | 7s. to 8s. |
| Cocoanuts, per sack | 15s. to 25s. |
| Custard Apples, per quarter-case | ... |
| Lemons (Lisbon), per case | 15s. to 22s. |
| Mandarins, per case | 6s. to 9s. |
| Mangoes, per case | 6s. to 9s. |
| Oranges (Navel), per case | 15s. |
| Oranges (Seville), per hundredweight | 12s. |
| Oranges (Other), per case | 10s. to 15s. |
| Papaw Apples, per quarter-case | 2s. to 3s. 6d. |
| Passion Fruit, per quarter-case | 6s. to 10s. |
| Peaches, per case | 4s. 6d. to 7s. |
| Peanuts, per lb. | 7d. to 11d. |
| Pineapples (Ripley), per dozen | 2s. 6d. to 9s. |
| Pineapples (Rough), per dozen | 2s. to 7s. 9d. |
| Pineapples (Smooth), per dozen | 5s. 6d. to 9s. 6d. |
| Plums, per quarter-case | 9s. to 11s. 9d. |
| Rockmelons, per dozen | 10s. to 28s. |
| Strawberries, per dozen boxes | 3s. to 9s. |
| Sugar-melons, per dozen | 18s. to 25s. |
| Tomatoes, per quarter-case | 7s. to 9s. 6d. |

## TOP PRICES, ENOGGERA YARDS, NOVEMBER, 1918.

| Animal. | NOVEMBER. Prices. |
|---|---|
| Bullocks ... ... ... ... ... ... ... ... | £26 15s. to £28 12s. 6d. |
| Cows ... ... ... ... ... ... ... ... | £16 to £19 12s. 6d. |
| Merino Wethers ... ... ... ... ... ... ... | 43s. 6d. |
| Crossbred Wethers ... ... ... ... ... ... | 42s. 9d. |
| Merino Ewes ... ... ... ... ... ... ... | 36s. 6d. |
| Crossbred Ewes ... ... ... ... ... ... ... | 33s. 6d. |
| Lambs ... ... ... ... ... ... ... ... | 32s. 9d. |
| Pigs (Porkers) ... ... ... ... ... ... ... | 54s. 6d. |

## RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, 1918, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING NOVEMBER, 1918 AND 1917, FOR COMPARISON.

| Divisions and Stations. | Average Rainfall. | | Total Rainfall. | | Divisions and Stations. | Average Rainfall. | | Total Rainfall. | |
|---|---|---|---|---|---|---|---|---|---|
| | Nov. | No. of Years' Records. | Nov., 1918. | Nov., 1917. | | Nov. | No. of Years' Records. | Nov., 1918. | Nov., 1917. |
| *North Coast.* | In. | | In. | In. | *South Coast*—continued: | In. | | In. | In. |
| Atherton ... ... | 2·36 | 17 | 1·82 | 6·33 | Nambour ... ... | 3·99 | 22 | 1·57 | 14·63 |
| Cairns ... ... | 4·25 | 36 | 2·67 | 7·25 | Nanango ... ... | 2·70 | 36 | 1·07 | 8·56 |
| Cardwell ... ... | 4·36 | 46 | 1·73 | 11·44 | Rockhampton ... | 2·24 | 31 | 0·83 | 5 61 |
| Cooktown ... ... | 2·94 | 42 | 0·78 | 3·77 | Woodford ... ... | 3·09 | 31 | 0·72 | 10·43 |
| Herberton ... ... | 2·49 | 31 | 3·77 | 3·87 | | | | | |
| Ingham ... ... | 4·16 | 26 | 3·04 | 10·80 | | | | | |
| Innisfail ... ... | 6·51 | 37 | 12·34 | 9·34 | | | | | |
| Mossman ... ... | 5·04 | 10 | ... | 13·26 | *Darling Downs.* | | | | |
| Townsville ... ... | 1·92 | 47 | 2·48 | 13·17 | | | | | |
| | | | | | Dalby ... ... | 2·64 | 48 | 0·31 | 5·63 |
| *Central Coast.* | | | | | Emu Vale ... ... | 2·60 | ... | 0·19 | 4·62 |
| | | | | | Jimbour ... ... | 2·53 | ... | 0·06 | 5·91 |
| Ayr ... ... ... | 1·83 | 31 | 1 20 | 12·50 | Miles ... ... | 2·66 | 33 | 0·47 | 9·94 |
| Bowen ... ... | 1·37 | 47 | 0·95 | 6·34 | Stanthorpe ... | 2·80 | 45 | 1·57 | 4·84 |
| Charters Towers ... | 1·63 | 36 | 4·09 | 4·70 | Toowoomba ... | 3·35 | 46 | 0·32 | 8·98 |
| Mackay ... ... | 3·00 | 47 | 2·64 | 6·58 | Warwick ... ... | 2·64 | 31 | 0·33 | 5·11 |
| Proserpine ... ... | 3·42 | 15 | 1·51 | 8·09 | | | | | |
| St. Lawrence ... | 2·38 | 47 | 5·09 | 8·01 | | | | | |
| | | | | | *Maranoa.* | | | | |
| *South Coast.* | | | | | | | | | |
| | | | | | Roma ... ... | 2·15 | 44 | 1·26 | 2·26 |
| Biggenden ... ... | 2·95 | ... | 1·17 | 3·28 | | | | | |
| Bundaberg ... ... | 2·73 | 35 | 1·46 | 6·48 | | | | | |
| Brisbane ... ... | 3·71 | 67 | 2·16 | 12·41 | *State Farms, &c.* | | | | |
| Childers ... ... | 2·96 | 23 | 2·12 | 7·96 | | | | | |
| Crohamhurst ... | 4·65 | ... | 0·97 | 12·31 | Bungeworgorai ... | 2·78 | 4 | 1·52 | ... |
| Esk ... ... ... | 3·19 | 31 | 2·92 | 7·54 | Gatton College ... | 2·82 | ... | 1·83 | 7·60 |
| Gayndah ... ... | 2·91 | 47 | 1·75 | 7·18 | Gindie ... ... | 2·89 | 6 | 3·12 | 7·16 |
| Gympie ... ... | 3·23 | 48 | 1·36 | 9·81 | Hermitage ... | 2·70 | ... | 1·08 | 5·25 |
| Glasshouse M'tains | 4·27 | 10 | 0·58 | 12·96 | Kairi ... ... | 3·52 | 4 | 1·38 | 2·45 |
| Kilkivan ... ... | 2·60 | 39 | 0·74 | 4·97 | Sugar Experiment Station, Mackay | 2·77 | ... | 2·63 | 5 97 |
| Maryborough ... | 3·23 | 47 | 0·24 | 7·93 | Warren ... ... | 4·52 | 4 | 0·60 | 6·81 |

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for November this year, and for the same period of 1917, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND, Divisional Officer.

# ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

## TIMES OF SUNRISE AND SUNSET.

AT BRISBANE.

| 1919. | JANUARY. | | FEBRUARY. | | MARCH. | | APRIL. | |
|---|---|---|---|---|---|---|---|---|
| Date. | Rises. | Sets. | Rises. | Sets. | Rises. | Sets. | Rises. | Sets. |
| 1 | 4 57 | 6·45 | 5·21 | 6·42 | 5·41 | 6·20 | 5·58 | 5·47 |
| 2 | 4·58 | 6 46 | 5·22 | 6·42 | 5·42 | 6·19 | 5·59 | 5·46 |
| 3 | 4·59 | 6·46 | 5·23 | 6·41 | 5·42 | 6 18 | 5·59 | 5·44 |
| 4 | 5·0 | 6·46 | 5·24 | 6·41 | 5·43 | 6·17 | 6·0 | 5·43 |
| 5 | 5·0 | 6·46 | 5·24 | 6·40 | 5·44 | 6·16 | 6·0 | 5·42 |
| 6 | 5·1 | 6·47 | 5 25 | 6·39 | 5·44 | 6·15 | 6·1 | 5·41 |
| 7 | 5·2 | 6·47 | 5·26 | 6·39 | 5·45 | 6·14 | 6·1 | 5·40 |
| 8 | 5·2 | 6 47 | 5·27 | 6·38 | 5·45 | 6·13 | 6·2 | 5·39 |
| 9 | 5·3 | 6·47 | 5·28 | 6 37 | 5·46 | 6·12 | 6·2 | 5·38 |
| 10 | 5·3 | 6·47 | 5·28 | 6·36 | 5·46 | 6·11 | 6 3 | 5·37 |
| 11 | 5·4 | 6·47 | 5·29 | 6 36 | 5·47 | 6·10 | 6·3 | 5·36 |
| 12 | 5·5 | 6·47 | 5 30 | 6 35 | 5·48 | 6 9 | 6·4 | 5·35 |
| 13 | 5·6 | 6·47 | 5 31 | 6·35 | 5·48 | 6·8 | 6·4 | 5·35 |
| 14 | 5·6 | 6·47 | 5·31 | 6·34 | 5·49 | 6 7 | 6·4 | 5·34 |
| 15 | 5·7 | 6·47 | 5·32 | 6·33 | 5·49 | 6·6 | 6·5 | 5·33 |
| 16 | 5·8 | 6 47 | 5·33 | 6·32 | 5·50 | 6·5 | 6 5 | 5·32 |
| 17 | 5·9 | 6·47 | 5 33 | 6·31 | 5·50 | 6·4 | 6·6 | 5·31 |
| 18 | 5·10 | 6·47 | 5·34 | 6·30 | 5·51 | 6·3 | 6 6 | 5·30 |
| 19 | 5·10 | 6·47 | 5·35 | 6·29 | 5·51 | 6·2 | 6·7 | 5·29 |
| 20 | 5·11 | 6·47 | 5·35 | 6·28 | 5·52 | 6·1 | 6·7 | 5·28 |
| 21 | 5·12 | 6·46 | 5·36 | 6·28 | 5·52 | 6·0 | 6·8 | 5·27 |
| 22 | 5·13 | 6·46 | 5·36 | 6·27 | 5 53 | 5·59 | 6·8 | 5·26 |
| 23 | 5·14 | 6·46 | 5·37 | 6·26 | 5·53 | 5·58 | 6·9 | 5·25 |
| 24 | 5·15 | 6·45 | 5·38 | 6·25 | 5 54 | 5 57 | 6·9 | 5 24 |
| 25 | 5·16 | 6·45 | 5·38 | 6·24 | 5 54 | 5·56 | 6·10 | 5·23 |
| 26 | 5·16 | 6·45 | 5·39 | 6·23 | 5·55 | 5·55 | 6·10 | 5·22 |
| 27 | 5·17 | 6·44 | 5·40 | 6·22 | 5·56 | 5·53 | 6·11 | 5·21 |
| 28 | 5·18 | 6·44 | 5·41 | 6·21 | 5·56 | 5·52 | 6·11 | 5·20 |
| 29 | 5·19 | 6·43 | ... | ... | 5 57 | 5·50 | 6·12 | 5·19 |
| 30 | 5·20 | 6·43 | ... | ... | 5·57 | 5 49 | 6·12 | 5·18 |
| 31 | 5·21 | 6·42 | ... | ... | 5·58 | 5·48 | ... | ... |

### PHASES OF THE MOON.

The Phases of the Moon commence at the times stated in Queensland, New South Wales, Victoria, and Tasmania.

| | | | H. | M. |
|---|---|---|---|---|
| 2 Jan. | ● | New Moon | 6 | 24 p.m. |
| 9 „ | ☾ | First Quarter | 8 | 55 p.m. |
| 16 „ | ○ | Full Moon | 6 | 45 p.m. |
| 24 „ | ☽ | Last Quarter | 2 | 22 p.m. |

The Moon will be nearest the earth on the 11th about 8 p.m., and farthest from the earth on 24th about 9 a.m.

| | | | | |
|---|---|---|---|---|
| 1 Feb. | ● | New Moon | 9 | 7 a.m. |
| 8 „ | ☾ | First Quarter | 4 | 52 a.m. |
| 15 „ | ○ | Full Moon | 9 | 38 a.m. |
| 23 „ | ☽ | Last Quarter | 11 | 48 a.m. |

The Moon will be nearest the earth on 5th about midday, and farthest away on the 21st about 6 a.m.

| | | | | |
|---|---|---|---|---|
| 2 Mar. | ● | New Moon | 9 | 12 p.m. |
| 9 „ | ☾ | First Quarter | 1 | 14 p.m. |
| 17 „ | ○ | Full Moon | 1 | 41 a.m. |
| 25 „ | ☽ | Last Quarter | 6 | 34 a.m. |

The Moon will be nearest the earth on the 4th about midnight, and farthest away on the 20th about 11 p.m.

For places west of Brisbane, but nearly on the same parallel of latitude—27½ degrees S.—add 4 minutes for each degree of longitude. For example, at Toowoomba the sun will rise and set about 4 minutes later than at Brisbane, and at Oontoo (longitude 141 degrees E.) about 48 minutes later.

At St. George, Cunnamulla, and Thargomindah the times of sunrise and sunset will be about 18 m., 30 m., and 38 minutes respectively, later than at Brisbane.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]

# Farm and Garden Notes for February.

FIELD.—The land intended for potatoes should now be ready for planting. Plant sound small potatoes, well shot, without cutting them. If large potatoes are cut into setts, there is a risk of their rotting, as the usual wet weather may be expected, with a hot, muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, kafir corn, imphee, sorghum, and vetches may be sown; but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop, sow swede turnips and mangelwurzels. Pick cotton as the bulbs burst. Do not pick until the dew has dried off the bulbs. Expose the picked cotton for a couple of hours to sun heat.

KITCHEN GARDEN.—Make preparations for good crops of vegetables for the early winter by ploughing or digging all unoccupied land, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, if prepared as follows:—

Spread a layer of black soil on the ground. Dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes, so that the compound shall contain—Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel. Mix thoroughly, and a little before planting moisten the heap with water, or, better still, with urine; cover with old mats, and let it lie till needed.

Most market gardeners will have cabbages and cauliflowers ready for transplanting. Do this during the month. In the pamphlet on "Market Gardening" issued by the Department, it is recommended to sow the seed from the middle of January to the middle of March, arranging the time, however, to suit early and late districts. For winter crops, the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, and are the most profitable. The Savoy cabbage does well here. The best cauliflowers to grow are the Large Asiatic, Eclipse, Early Dwarf, and Le Normand. If the aphis appears, spray with tobacco solution.

Sow French beans, butter beans, beet, carrot, turnip, radish, cabbage, cauliflower, cress, peas. Should the weather prove dry after the January rains, give the plants a good soaking with water. Gather all fruit of cucumbers, melons, French and other beans, and tomatoes as they ripen, to ensure the continued production of the vines and plants.

FLOWER GARDEN.—Thin out and tie up dahlias. Keep the weeds down, and never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, aster, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemum, verbenas, petunias, pentstemons, &c. Dianthus, sown now and planted out in March, will bloom during the whole year, if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep, as on the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should be covered with fine soil to a depth equal to their own size; for instance, a pea is about one-eighth of an inch in diameter, therefore, cover it with one-eighth of an inch of soil.

# Orchard Notes for February.

In order that the series of monthly notes that have appeared for some years past in the "Agricultural Journal" might be rendered of more value to our fruit-growers, advantage was taken of the commencement of the new year to revise them and bring them up to date. At the same time, the notes have been somewhat altered, as, instead of making them of a general nature, applicable to the whole of the State, they are, to a certain extent, localised, as, although the general principles of cultivation, manuring, pruning, treatment of fruit pests, as well as of the handling and marketing of the fruit, are applicable to the State as a whole, there are many matters that are of interest to individual parts of the State rather than to the whole State; and, further, notes that are applicable to the Southern part of the State for one month are not always applicable to the North for the same month.

In order to carry out this idea the State has been divided as follows:—

1. The Southern Coast Districts, south of the Tropic of Capricorn;
2. The Tropical Coast Districts;
3. The Southern and Central Tablelands.

This plan has met with such general approval during the past year that the notes will henceforth be published in accordance therewith.

## THE SOUTHERN COAST DISTRICTS.

The earlier summer fruits, including grapes, will be pretty well over, but pine-apples, mangoes, and bananas are in full fruit. The bulk of the main summer crop of pines ripens during the month, and growers are in consequence kept very busy sending them to both our local markets and canneries, and to the Southern States. The planting of all kinds of tropical fruits can be continued where necessary, though earlier planting of both pines and bananas is to be recommended. Still, if the land is thoroughly prepared—viz., well and deeply worked—they can be planted with safety, and will become well established before winter. The month is usually a wet one, and both tree and weed growth is excessive. If unable to get on the land with horses to keep down weed growth, use the scythe freely in the orchard before weeds seed, as by doing so you will form a good mulch that will tend to prevent the soil washing, and that when ploughed in later on will add a considerable quantity of organic matter to the soil, thus tending to improve its mechanical condition, its power of absorbing and retaining moisture, as well as to increase its nitrogen contents.

This is the best month of the year in which to bud mangoes in the Brisbane district. The bark of the stock to be budded must run very freely, and the scion, when placed in position, must be tied very firmly. The bark of the scion should be slightly thicker than the bark of the stock, so that the material used to tie it keeps it firmly in its place. As soon as the bud is tied, ringbark the stock just above the bud, so as to force the sap of the stock into scion, so that a union will take place quickly.

Where cyaniding of citrus and other trees has not been concluded it may be continued during the month, as fruit treated now will probably keep clean and free from scale insects till gathered. If the trees have been treated with Bordeaux mixture, do not cyanide, as cyaniding should always be done previous to spraying with Bordeaux mixture.

If Maori is showing, spray with the sulphide of soda wash. Look out for Black Brand and also for the Yellow Peach Moth towards the end of the month in the earlier districts. Spraying with Bordeaux mixture is advisable in the case of both of these pests.

Get land ready for strawberry planting, so as to be ready to set out runners next month. Some growers set out plants as early as the end of February, but March is to be preferred. Citrus and deciduous trees can still be budded during the month. Young trees in nursery should be kept clean and attended to; ties should be cut where necessary, and the young trees trained to a straight single stem.

## THE TROPICAL COAST DISTRICTS.

As the month is usually a very wet one in this part of the State, very little work can be done in the orchard other than keeping down excessive weed growth by means of a scythe. When citrus trees are making excessive growth and throwing out large numbers of water-shoots, the latter should be cut away, otherwise they are apt to rob the rest of the tree, and thus injure it considerably. Many of the citrus trees will come into a second blossoming during the month, and this will produce a crop of fruit ripening towards the end of winter and during the following spring. The main crop, where same has set in spring, will be ripening towards the end of the month, but as a rule insect life of all kinds is so prevalent at this time of year that the bulk of the fruit is destroyed. Where there is sound fruit, however, it will pay to look after. If the weather is wet it should be artificially dried before packing; but if there are periods of sunshine, then the fruit can be cut and laid out on boards or slabs in the sun, so that the extra moisture of the skin can be dried out. Care will have to be taken not to sun-scald the fruit, or to dry it too much; all that is required is to evaporate the surplus moisture from the skin, so that the fruit will not speck when packed.

Tropical fruits of all sorts can be planted during the month. Budding of mangoes and other fruits can be continued. Bananas must be kept netted, as fly is always bad at this time of year.

## THE SOUTHERN AND CENTRAL TABLELANDS.

The marketing of later varieties of apples, pears, plums, peaches, and nectarines will occupy the attention of the Stanthorpe growers. The grape harvest will also extend right through the month. Every care should be taken to see that the fruit-fly and codling moth are not allowed to spread, although the best work in fighting these pests has to be done during the months of December and January, as on the action then taken, if carried out systematically, the freedom of the later fruits from infestation mainly depends.

Handle the fruit carefully, and see that no fly or codling moth infested fruit leaves the district. The grapes ripening as they do when this fruit is over in the earlier parts of the State, should be sent not only to Brisbane, but to all other parts of the State. For long shipment nothing can beat crates holding 6-lb. baskets. The fruit should be gathered some hours before packing, and be placed in the sun, so as to become thoroughly dry, and to allow the stems to become wilted, as this causes the fruit to hang on the bunch much better, and consequently to reach its destination in better order.

If parrots and flying foxes are troublesome, organised shooting parties or poisoning with strychnine are the best means of dealing with those pests.

The crop of grapes will be about over in the Roma and other inland districts. Citrus trees, when infested by Red Scale, should be cyanided. The orchard should be kept well cultivated after every rain, and when there is no rain, but water is available for irrigation, if the soil requires it, the trees should get a good soaking, which, if followed by thorough cultivation, will carry the trees on till the fruit is ripe.